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OF THE

DEPARTMENT OF AGRICULTURE

OF THE

PROVINCE OF ONTARIO.

1901.

VOL. I.

PRINTED BY ORDER OF

THE LEGISLATIVE ASSEMBLY OF ONTARIO

TORONTO:
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1902.

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TWENTY-SEVENTH ANNUAL REPORT

OF THE

ONTARIO AGRICULTURAL COLLEGE

AND

EXPERIMENTAL FARM

1901.

(*PUBLISHED BY THE ONTARIO DEPARTMENT OF AGRICULTURE, TORONTO.*)

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TORONTO.

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TWENTY-SEVENTH ANNUAL REPORT

OF THE

ONTARIO AGRICULTURAL COLLEGE

AND

EXPERIMENTAL FARM

FOR THE YEAR 1901.

GUELPH, December 31st, 1901.

To the Honorable JOHN DRYDEN,
Minister of Agriculture:

SIR,—I have the honor to transmit herewith the Twenty-seventh Annual Report of the Ontario Agricultural College and Experimental Farm.

In this Report the work of the year 1901 has been briefly reviewed under the following heads:

PART I. REPORT OF PRESIDENT.
PART II. REPORT OF PROFESSOR OF PHYSICS AND LECTURER IN ENGLISH.
PART III. REPORT OF PROFESSOR OF BIOLOGY AND GEOLOGY.
PART IV. REPORT OF ASSOCIATE PROFESSOR OF BIOLOGY.
PART V. REPORT OF PROFESSOR OF CHEMISTRY.
PART VI. REPORT OF PROFESSOR OF VETERINARY SCIENCE.
PART VII. REPORT OF PROFESSOR OF DAIRYING.
PART VIII. REPORT OF PROFESSOR OF AGRICULTURE AND FARM SUPERINTENDENT.
PART IX. REPORT OF PROFESSOR OF HORTICULTURE.
PART X. REPORT OF PROFESSOR OF BACTERIOLOGY.
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PART XII. REPORT OF MANAGER OF POULTRY DEPARTMENT.
PART XIII. REPORT OF LECTURER ON APICULTURE.
PART XIV. REPORT OF THE PHYSICIAN.

I have the honor to be, Sir,
Your obedient servant,

JAMES MILLS,
President.

THE ONTARIO AGRICULTURAL COLLEGE

AND

EXPERIMENTAL FARM

GUELPH, ONTARIO.

HON. MR. DRYDEN, Minister of Agriculture,
Toronto, Ont.

STAFF IN 1901.

JAMES MILLS, M.A., LL.D.	President
H. H. DEAN, B.S.A.	Professor of Dairy Husbandry
J. HUGO REED, V.S.	Professor of Veterinary Science
J. B. REYNOLDS, B.A.	Professor of Physics and Lecturer in English
C. A. ZAVITZ, B.S.A.	Director of Field Experiments (College and Co-operative)
Wm. LOCHHEAD, B.A., M.S.	Professor of Biology and Geology
G. E. DAY, B.S.A.	Professor of Agriculture and Farm Superintendent
H. L. HUTT, B.S.A.	Professor of Horticulture
F. C. HARRISON, B.S.A., D.P.H. (who has charge of Library)	Professor of Bacteriology
R. HARCOURT, B.S.A.	Professor of Chemistry
M. W. DOHERTY, B.S.A., M.S.	Associate Professor in Biology
W. P. GAMBLE, B.S.A.	Associate Professor of Chemistry
M. CUMMING, B.A., B.S.A.	Assistant in Agriculture
H. STREIT, D.M.V.	Assistant in Bacteriology
Miss ALICE ROWSOME, B.A.	Assistant in Library and Instructor in French and German
W. J. RUTHERFORD	Dean of Residence and Instructor in English and Mathematics
W. . GRAHAM, B.S.A.	Manager and Instructor in Poultry Department
H. R. ROWSOME	Lecturer on Apiculture
Captain W. CLARK	Instructor in Drill and Gymnastics
W. O. STEWART, M.D.	Physician
G. A. PUTNAM, B.S.A.	Secretary
A. McCALLUM	Bursar

PART I.

REPORT OF THE PRESIDENT.

The past year has been one of marked activity and progress in the history of the Ontario Agricultural College and Experimental Farm,—alterations in buildings, new buildings, liberal donations by wealthy men, short special courses, and largely increased attendance of students.

Alterations and Additions

The gradual increase in the number of students applying for admission, made it necessary to increase the number of dormitories, either by the erection of a new building or by alterations in the residence which had served the purpose fairly well till about two years ago; and, the latter course having been decided upon, the south wing of the main College building, hitherto occupied by the library and museum, was changed into students' rooms—heated, lighted, furnished, and got ready for occupation by the 1st September. These alterations made provision for 49 additional students; and by the first of October there were applications for nearly every room, old and new.

These alterations involved also the change of a class-room into offices, and the construction of a college post office, with excellent boxes of the latest pattern, in one end of what has hitherto been the College Reading-Room.

In the Poultry Department also, we made extensive alterations and additions, to provide for the Special Short Course in Poultry Raising, commencing on the 10th January and continuing for four weeks. These alterations consisted chiefly of changes in and additions to the main building, giving us another office or common room, a new office for the manager, a judging room, and a wash room for men on the ground floor, with a sitting-room and lavatory for ladies and a commodious class-room on the first floor, all heated with hot water.

New Buildings.

Two new buildings were erected during the year, one by vote of the Legislature and the other by the Massey family of Toronto. The Provincial building is a large, plain structure of three stories, red pressed brick with Guelph limestone trimmings, intended to accommodate the physical and biological laboratories and the college museum; the other is a beautiful building of red pressed brick with foundation and trimmings of Credit Valley Brown Stone, providing a students' hall, a large reading room, a library for 75,000 volumes, a librarian's room, three seminary rooms, and five rooms for fellows and assistants,—heated, lighted, furnished, and all complete.

Benefactors of the College and the People of Canada

The winter of 1901 will be memorable in the annals of the College, and, we might say, of the Dominion; as then, for the first time in the history of the country, a man of means made a considerable contribution unconditionally to a public institution directly under the control of the Provincial Legislature—then the late and much lamented W. E. H. Massey, of Toronto, with generous liberality, supported by his brother, Chester D. Massey, and his sister, Mrs. Lillian Massey Treble, placed at the disposal of the Ontario Government the sum of $40,000 for the erection, heating, lighting, and furnishing of a College Hall and Library. This building to be known as "the Massey Hall and Library," is nearing completion and will be ready for occupation in June next. For a brief description, see the preceding paragragh.

This benefaction will be a lasting benefit to our Canadian farmers; and I am pleased to state that it has already drawn attention to the College and has raised it to a higher level in public estimation.

In the fall of the same year, 1901, another noteworthy event occurred. Sir William C. Macdonald, of Montreal, who has done such great things for McGill University by his magnificent gifts to the science department of that institution, and for the people of Canada by his large contributions for the establishment and temporary maintenance of Manual Training Schools in the different Provinces of the Dominion,—this liberal, broad-minded, and public spirited Canadian decided to give the Ontario Government $125,000 for the establishment of a Department of Domestic Science, Nature Study, and Manual Training in connection with the Ontario Agricultural College, to train Public School teachers from any part of the Dominion, and provide practical education for women, especially farmers' daughters. Surely these two events in the same year constitute an epoch in the history of the College; and as President I wish to express my heartfelt thanks to the Massey family, Sir William Macdonald, Prof. J. W. Robertson, who has been acting for Sir William, and Mrs John Hoodless, of Hamilton, who judiciously impressed upon Sir William the importance of training our girls in Home Economics, or the science and art of housekeeping in its various branches and details.

Short Special Courses.

With some hesitation, we decided about midsummer to offer two short courses in the winter of 1902,—one in Live Stock and Grain Judging, to commence on the 8th January and last for two weeks; and another on Poultry Raising, to commence on the 10th January and last four weeks.

The experiment is now a thing of the past, and we have to report that both these courses were an unqualified—we might say—a triumphant success. Nothing better could be desired.

On account of the practical work required we were unable to handle more than 30 in addition to the regular students, in the Poultry Department; but we were not obliged to place any restriction on the number to be admitted for Stock Judging; and the result was that we had 220 in regular attendance—110 more than we could accommodate in our live stock class-room. Hence we had to divide the class and repeat the course.

The instruction in both courses was given by our regular professors, the Hon. John Dryden (Minister of Agriculture), and a few of the leading stockmen and poultrymen of the Province.

The classes were composed chiefly of young men, but there was a very fair proportion of men over fifty years of age, all anxious to learn—so anxious that they were at the College every day at eight o'clock for Mr. Zavitz's talks, with practice, in grain judging, or Prof. Lochhead's on weeds and weed seeds; from 9 a.m. to 5 p.m., excepting an hour and a half for lunch, with Prof. Day, Dr. Reed, Mr. Cumming, and others in judging horses, cattle, sheep, and swine; and from 7.30 to 9.30 p.m., listening to lectures in the class-room.

We hope to continue these short courses from year to year.

Students in Attendance.

The total number of students registered for work at the College in 1891, was 281 in the General course, 80 in the Dairy Course, and 22 Specialists, less two registered in both General and Dairy Courses,—making a net total of 381 in these two courses.

The three short courses (Stock Judging, Poultry Raising, and Domestic Science), numbering 344, added to the foregoing, would make a total of 725 who registered for work at the College within the twelve months ending February 15, 1902. The students in the short courses were nearly all from this Province; and of those in the General and Dairy Courses, including 22 Specialists, 295, or a little over 82 per cent (nearly all farmers' sons), were from Ontario, 29 from other provinces of the Dominion, and 35 from other countries.

The rooms in the College Residence are reserved, so far as they may be required, for Ontario Students in the General Course. Ontario Students in the General Course ordinarily pay $20 a year tuition fee. If nominated by County Councils, they are admitted free of tuition. Students from all places outside of the Province, pay $50 a year tuition fee.

Ages and Religious Denominations.

The limits of age and the average age of students in the General Course in 1901 were nearly the same as in 1900, 16 to 35 years; average 20 years.

The religious denominations were as follows: *General Course*,—92 Presbyterians, 80 Methodists, 44 Episcopalians, 22 Baptists, 20 Roman Catholics, 5 Disciples, 3 Congregationalists, 2 United Brethren, 2 Christadelphian, 2 Lutheran, 1 Mennonite, 1 Church of Christ, 1 Greek Orthodox, 1 Christian Association, 1 Friend, 1 Evangelical Association, 1 Plymouth Brethren, 1 New Jerusalem, 1 Free Thinker, 1 Christian Science. *Dairy Course*,—29 Methodists, 26 Presbyterians, 8 Baptists, 6 Episcopalians, 4 Roman Catholics, 3 United Brethren, 1 Mennonite, 1 Christian.

Analysis of College Roll (General Course).

1. From Ontario.

Brant	8	Kent	3	Pr. Edward	1
Bruce	5	Lambton	5	Rainy River	2
Carleton	6	Lanark	3	Renfrew	1
Dufferin	4	Leeds	4	Russell	2
Dundas	5	Lennox and Addington	3	Simcoe	11
Durham	2	Lincoln	5	Stormont	1
Elgin	8	Middlesex	6	Victoria	2
Essex	2	Norfolk	4	Waterloo	6
Frontenac	1	Ontario	5	Welland	4
Glengarry	2	Oxford	8	Wellington	18
Grenville	2	Parry Sound	2	Wentworth	10
Grey	8	Peel	1	York	16
Haldimand	1	Perth	7	Toronto	13
Halton	8	Peterborough	2		
Hastings	3	Prescott	4		222
Huron	8				

2. From other Provinces of the Dominion.

British Columbia	1	Nova Scotia	6	Assiniboia	3
Manitoba	4	Quebec	10		
New Brunswick	3				27

3. From other Countries.

England	7	United States	4	Sweden	1
Jamaica	3	Argentine Republic	14		
Mauritius	1	Asia Minor	1		32
Scotland	1				

Total in General Course	281
Total in General and Dairy Courses	359

It will be noticed that 43 Ontario counties and districts were represented by students in the General Course in 1901. There were 18 from Wellington, 16 from York, 11 from Simcoe, 10 from Wentworth, 8 each from Brant, Elgin, Grey, Halton, Huron, and Oxford, 7 from Perth, 6 each from Carleton, Middlesex, and Waterloo, 5 each from Bruce, Dundas, Lambton, Lincoln, and Ontario, and smaller numbers from other counties.

County Students.

By Legislative enactment, each county council of the Province has power to send one student to the College free of tuition. Of those on the roll in 1901, eighty were

nominated by county councils, and hence were exempt from the payment of tuition fees. The counties and districts which exercised the power of nomination last year (44 in number) were the following: Addington, Algoma, Brant, Bruce, Carleton, Dufferin, Dundas, Durham, Elgin, Essex, Glengarry, Grenville, Grey, Haldimand, Halton, Hastings, Huron, Kent, Lambton, Lanark, Leeds, Lennox, Lincoln, Middlesex, Norfolk, Northumberland, Ontario, Oxford, Parry Sound, Peel, Perth, Peterborough, Prescott, Prince Edward, Renfrew, Russell, Simcoe, Stormont, Victoria, Waterloo, Welland, Wellington, Wentworth, and York.

Changes in Staff.

There have been an exceptionally large number of changes in the College staff during the past year.

About the middle of the summer, A. T. Wiancko, B.S.A., Assistant in the Library and Instructor in German, left for a much higher salary in the Western States.

In the month of September, Rolland Craig, B.S.A., temporary assistant in the Physical Laboratory, left for a post-graduate course in Forestry at Cornell University.

Dr. A. E. Shuttleworth, who had been Professor of Chemistry for twelve years and had rendered good service in the department which he represented, resigned his professorship about the end of October, to accept a position at a very much larger salary with the Ontario Beet Sugar Co., of Toronto.

At the same time, I. N. Beckstedt, B.A., who had faithfully and efficiently filled the difficult position of Dean of Residence and Instructor in English and Mathematics for several years, resigned his mastership and returned to his *alma mater*, Queen's University, to study theology.

Early in December, Mr. A. McCallum, who had faithfully discharged the duties of Bursar for nearly 17 years, was suddenly cut off by an attack of pneumonia—taken ill Saturday night; dead Monday morning. His many friends in the College and city sympathize with his highly respected widow and family.

At the end of the year, G. A. Putnam, B.S.A., who has been the President's most faithful, efficient, and obliging secretary for twelve or fourteen years, resigned his secretaryship for a better position and a higher salary as assistant manager of the City Diary Co., Toronto.

The following officers have recently been appointed, most of them to fill the vacancies caused by death and voluntary resignations:

Robert Harcourt, B.S.A.	Professor of Chemistry.
W. P. Gamble, B.S.A.	Associate Professor of Chemistry.
W. C. Good, B.A., (Tor.)	Assistant in the Department of Chemistry.
Melville Cumming, B.A., B.S.A.	Assistant in Agriculture.
Dr. H. Streit	Assistant in Bacteriology.
W. J. Rutherford	Dean of Residence and Instructor in English and Mathematics.
Miss Alice Rowsome, B.A. (Tor.)	Assistant in Library and Instructor in French and German.
G. B. McCalla, B.S.A.	Fellow in Physics.
B. S. Pickett	President's Secretary.
Miss A. O. Hallett	Stenographer.
S. Springer	Bursar.

English, with a Reference to Some Recent Criticisms.

Now and then we hear through a newspaper or an agricultural journal that the "ideal" agricultural college does not teach anything but technical subjects (sometimes spoken of as *the practical branches*, such as field agriculture, live stock, dairying, poultry raising, and horticulture), with a smattering of a few sciences—how to handle manure, dig and plow the soil, plant and sow crops, and judge, breed, feed, and care for horses, cattle, sheep, and swine. That is all a farmer needs, and why should an agricultural

college spend time on anything else? Boys at an agricultural college studying English! Absurd! They might as well study Greek or Hebrew. So says our critic.

Professional men, like the writer of this article, should, of course, spend some time in learning how to speak and write their mother tongue, that they may be able to take their place and hold their own in the affairs of church and state; but what do farmers need with speaking and writing? Their business is to dig, delve, and grub; and their education should be strictly confined to the study and discussion of the best methods of performing these interesting operations. They are the foundation of our business, social, and political fabric, as some professional men and editors in their easy chairs love to call them—the stone and mortar down in the earth to support the beautiful and complicated structure of brick and wood so skilfully erected on top of them. That is their place. There they should stay; and if they must have some knowledge of English, let them go to the public and high schools for it.

In reply, I venture to affirm that not five in every fifty of the young men at our College could get the money and spare the time necessary to take a High School course and afterwards spend two years at the Agricultural College; and what benefit would it be to the forty-and-five, or 90 per cent, that English is well taught in the High Schools? If they can learn some English while they are studying technical subjects at the Agricultural College, well and good. If not, they must, like the great majority of the Short Course students in "the ideal Agricultural College." enter upon the duties and responsibilities of life in gross ignorance of this most important of all subjects to the average citizen in this country.

Further, it is all right, and in fact necessary, for students in a medical college to study the elements of inorganic and organic chemisty before proceeding to apply the principles of chemistry in the later technical studies or the practice of medicine; but not so, says our critic, with students of agriculture. It is a waste of time for them to study the principles of chemistry. They should proceed at once, "without a particle of instruction" in "elementary inorganic or organic chemistry"—at once to discuss "the fundamental principles and practices of agricultural chemistry and plant life" not studied or learned by themselves, but "delivered to them," *ex cathedra,* "without the fripperies of scientific formulas or nomenclature."

In answer to this, I would say that short courses and short cuts in education are all right in their place. They are, no doubt, the best thing for some people, young and old, and for those colleges which cannot induce any considerable number of students to stay long enough for anything else: but to commend them as the ideal thing for all farmers, and to maintain that students of agriculture, because of the hurry to get at results, should proceed at once to use terms which they do not understand and discuss the foundation principles and practices of agricultural chemistry, without a particle of instruction in elementary chemistry, is, to say the least, a very grave educational mistake—such a mistake as I would not expect to find in the editorial columns of one of our best papers.

We are disposed to give short courses their proper place; but to all suggestions, that nothing should be done in our Agricultural College towards raising Canadian farmers above the level of mere drudges,—hewers of wood and drawers of water for the educated classes of the community,—*we emphatically say no.* The purely practical, or bread-and-butter, subjects should be emphasized and receive a large share of time and attention, as they do in this College—*and with as good practical results as can be shown anywhere else*; but our young men should, at the same time, be taught in the simplest and most practical way and with as little expenditure of time as possible the fundamental princles of chemistry, botany, etc., as a preparation for the subsequent application of these principles in agricultural and animal chemistry, dairying, and horticulture. They should also, in view of the general neglect of the early education of young farmers, be taught a limited amount of practical English, to give them something like a reasonable facility in the use of their mother tongue.

Half the farmers in this country are shorn of their strength and fail to take their place and hold their own among the professional classes simply because they have never learned to speak and write fairly good English; and all the while we have wiseacres in the agricultural press and elsewhere telling us that English in an agricultural college is a non-essential, a sort of side issue,—about as much use as Greek or Hebrew.

Physics.

The usual instruction in physics was given in 1901, but less practical work was done than formerly, owing to a serious lack in class-room and labaratory accommodation for the large classes now in attendance,—a difficulty which will be overcome as soon as the new Physical and Biological Laboratories in course of construction are completed.

Some investigations in soil temperatures, especially as affected by cultivation, have been made during the year; but the results are yet incomplete and do not warrant the enunciation of definite conclusions.

Facts regarding destruction by lighting in this Province have been gathered and classified by Professor Reynolds, in the hope of reaching before long some conclusions that may be of value to the community.

Professor Reynolds has also investigated the Hanrahan System of cold storage, and has given some attention to the ventilation of stables.

For information on these points, see Professor Reynolds' report, Part II of this volume.

Biology.

Work in the Biological Department, in charge of Prof. Lochhead and his associate, Prof. M. W. Doherty, has gone on as usual, although the department has been hampered and hindered very much for want of room and necessary appliances. especially microscopes, physiological apparatus, and an insectary. We hope to have sufficient room when the buildings in process of erection are completed; and we have made a strong appeal to the Government this year for the laboratory appliances so much needed.

Prof. Lochhead gave some attention to the fumigation of nursery stock throughout the Province in the spring of the year, and issued a bulletin on the *Hessian Fly* in the month of August. He also published a newspaper bulletin on *Wheat Rust* in August, and gave some special attention to *Black Rot in Grapes* during the fall. For facts and conclusions, so far as they were reached, see Prof. Lochhead's report, Part III of this volume.

M. W. Doherty, the Associate Professor in the department, conducted a number of experiments in spraying crops, especially oats, with Sulphate of Copper, or Blue Stone, to kill wild mustard. These experiments were made in some of the East Midland Counties —Ontario, Prince Edward, and other counties further east; and the reports received from farmers describe the results as quite satisfactory. Hence we infer that the question of treating mustard in this way will depend on the cost of appliances, materials, and labor.

Prof. Doherty also added a considerable number of plants to our Herbarium for the instruction of future classes, collected data on the habits of birds, and prepared some notes on the migration of birds in this locality.

For full information on these and several other points, see Prof. Doherty's report, Part IV of this volume.

Veterinary Science.

Our veterinary surgeon, J. Hugo Reed, V.S., looks after the stock on the College farm and delivers courses of lectures on veterinary anatomy, pathology, obstetrics, and materia medica. Besides this he gives stable lectures to the first year students, and a thorough drill in "practical horse" to the second year, that is, practice, with talks and suggestions in judging for soundness, administering medicine, and performing minor operations. During the past year he has shortened the time devoted to anatomy, and has given considerable attention to horse judging in different classes —heavy draught, carriage, saddle, etc. For Dr. Reed's report of his work during the year, see Part VI of this volume.

Chemistry.

Our Professor of Chemistry, Dr. A. E. Shuttleworth, who served us faithfully for a number of years, and gave much attention to the beet sugar question after his return from Germany in 1899, resigned his position in the College about the middle of the Fall Term, to accept from the Ontario Beet Sugar Company a much larger salary

than we were paying him. Our Associate Professor of Chemistry, Robert Harcourt, B.S.A., was promoted to fill the vacancy; W. P. Gamble, B.S.A., who was assistant in Chemistry last year, was promoted to the position of Associate Professor; and W. C. Good, B.A. (Tor), was appointed assistant in the Department, to enter upon his duties on the 1st January, 1902.

Dr. Shuttleworth, having devoted most of his time and attention to the sugar beet business during the year, is reporting direct to the Minister of Agriculture on that subject; and Prof. Harcourt, not having entered upon his duties as full professor till near the close of the year, has a shorter report than is usually furnished by the Chemical Department.

Analyses. A large number of analyses of water were made during the year for corporations and individuals throughout the Province; but the applications under this head became so numerous that we were at length forced to refuse all, except from creameries and cheese factories. Samples of sorghum ensilage, mill by-products, and soap for spraying San José scale were also analyzed and the results reported to the senders.

Research. Several chemical investigations have been in progress in connection with the Dairy Department: (1) to determine the loss of fat and casein and the effect on the acid, caused by the washing of curds; (2) to determine the products which result from the decomposition of the casein, or nitrogenous matter, of cheese when cured in cold storage, as compared with the products from curing in the ordinary way.

Sugar Beets. Investigations to determine the suitability or unsuitability of different parts of Ontario for the production of sugar beets were continued throughout the year, tests having been made in 15 different localities by 25 experimenters in each locality. The yield of sugar from the beets grown in these localities varied from 14.5 to 17.3—average, 15.6 per cent. The purity varied from 83.7 to 90.6—average, 87.5; and the yield of beets was from 14 to 22 tons per acre—average, 17 tons, 495 lbs. For details, see Prof. Harcourt's Report, Part V of this volume.

Dairy Department.

Prof. Dean's Report for 1901 deals with the class-room and practical work done by the students in the General Course and by those who took the three dairy courses, viz., the Farm Dairy Course, the Short Creamery Course, and the Long Factory Course in both butter and cheese. It also describes a number of experiments made during the year.

Cheese-making. The year's experiments in cheese making dealt chiefly with the methods of caring for milk, the washing of curds, curing in light versus dark rooms, and curing at different temperatures, with the following results and conclusions:

(1) That cooling milk for cheese making below 70° F. is necessary in hot weather, and that many of the troubles in making cheese in hot weather could be overcome by adopting some method of cooling the milk.

(2) That there is no advantage in washing curds, unless under special circumstances, but rather a loss of about one pound of cured cheese per 1,000 lbs. of milk. "Fast-working" curds and curds with bad flavors may be, and usually are, improved by washing, especially the former.

(3) That neither light nor the absence of light in a cheese-curing room has any effect on the quality of cheese cured in the room.

(4) That the curing of cheese in cold storage at a temperature of about 40° F. gives very satisfactory results.

As a consequence of the last conclusion, it is strongly urged that co-operative cold storage buildings be provided at central points, and that cheese, especially that made in July and August, be placed in these buildings *as soon as possible* after it is made. This seems necessary for the permanent success of the cheese trade.

Butter-making. The experiments in butter making were, to obtain more reliable information regarding the pasteurization of milk for butter-making, commercial butter cultures, and the moisture and salt content of butter as affected by different methods of making.

Much pasteurization was done at 140°, 160°, 185°, 195°, and 200° F., and the results were published in a bulletin recently issued by Professors Dean and Harrison,—

pasteurization at a temperature of 185° F. being recommended for export butter and butter to be placed in cold storage.

Dairy Herd. The Dairy Herd averaged over 8,000 lbs. of milk and 326 lbs. of butter per cow in 1901. The Department is aiming at 10,000 lbs. of milk and 400 lbs. of butter per cow in the year.

See Prof. Dean's report, Part VII of this volume.

Farm and Feeding.

In Prof. Day's report, Part VIII of this volume, will be found a short but clear account of the crops grown on the farm during the year, with observations on the condition and preparation of the soil for each crop, and more detailed information regarding experiments in feeding steers and swine.

Silage for Steers. Steers fed on silage, hay, and meal, made somewhat larger gains and at considerably less cost than steers fed on roots, hay, and meal,—the hay and meal being the same in each case.

Those fed on silage, hay, and meal consumed less dry matter per pound of gain than those fed on roots, hay, and meal,—which will be noted as an important matter in view of the fact that the labor necessary to produce a ton of dry matter in roots cost $9.40 and in silage $3.10.

Corn Meal for Steers. Steers fed on corn meal made larger gains and required less meal per pound of gain than steers fed on pea meal, and than steers fed on equal parts of pea meal and corn meal.

Roots for Hogs. Hogs fed equal parts by weight of meal and roots, made more economical gains and produced a better quality of bacon than hogs fed meal alone.

Rape for Hogs. Hogs fed on rape pasture and a liberal meal ration required much more meal for a pound of gain than hogs fed rape and the same meal mixture in pens. The quality of bacon was first class from both.

The Bacon Hog. The Yorkshires proved most suitable for producing export bacon, of the six breeds used in experiment, viz , Yorkshire, Berkshire, Tamworth, Duroc Jersey, Chester White, and Poland China.

See Prof. Day's report, Part VIII of this volume.

Inter-Collegiate Stock Judging Competition in 1901.

At the International Live Stock Exposition, held in Chicago during the first week of December, students from eight agricultural colleges competed for supremacy in judging different classes of live stock. The students were required to judge nineteen different classes of stock, made up as follows :

Cattle : Shorthorns, 2 classes ; Aberdeen-Angus, 2 classes ; Herefords, 2 classes ; fat cattle, 2 classes ; Red Polls, 1 class.

Sheep : One class each of Cotswolds, Shropshires, and fat sheep.

Swine : Poland-Chinas, 2 classes ; fats hogs, 1 class ; bacon hogs, 1 class.

Horses : Clydesdales, 2 classes ; market horses, 1 class.

Prizes were given in each class of stock to individual students, and in addition to these prizes, a valuable challenge trophy, known as the "Spoor Trophy," was put up for competition among the colleges and awarded on the highest aggregate score made by any three students of one institution. Our college sent a team of five students, viz., W. A. Dryden, Brooklin, Ontario ; G. I. Christie, Winchester, Ontario ; L. A. La Pierre, Paris, Ontario ; R. H. Williams, Corbetton, Ontario ; and F. S. Jacobs, Minesing, Ontario.

Throughout the competition, our students did good, steady work. In nearly every class some of them stood among the first seven in proficiency. In three classes we had a man at the top of the list, and in four others one of our men stood second. The character of their work can be judged best from the fact that they stood second in the Spoor Trophy competition, which, as was previously explained, was decided by the standing of three students from one college. The three of our students who stood highest in the latter competition were Messrs. Dryden, Christie, and La Pierre. Seven out of the eight colleges entered in the Spoor Trophy competition, and they ranked in the following order :

Iowa, Ontario, Illinois, Michigan, Wisconsin, Indiana, and North Dakota.

It is an interesting fact that the students from the colleges ranking first, second, fourth, and fifth in proficiency were trained by ex-students of our own institution.

Everything considered, therefore, our men made a very creditable showing, and the Province may justly feel proud of their record.

Horticulture.

In the Horticultural Department, the work of the past year has been along the following lines: Instruction, experiments (college and co-operative), preparation for exhibit at the Pan-American, inspection of Fruit Experiment Stations and report thereon, and practical addresses at orchard meetings in several localities.

So far, our experimental work in this department has been in variety tests with strawberries, raspberries, blackberries, currants, gooseberries, tomatoes, and certain plants and flowers,—in our own garden and orchard; and with various small fruits in co-operative work on about 1,000 farms throughout the Province. For particulars, results, and conclusions, see Prof. Hutt's report, Part IX of this volume.

One hundred jars of choice varieties of small fruits were put up under the supervision of Prof. Hutt and sent to the Pan American, where they attracted a great deal of attention and were awarded a silver medal.

Bacteriology.

There seems to be no limit to the field for practical and promising investigation under this head: questions about milk, butter, and cheese; problems regarding tuberculosis, hog cholera, anthrax, glanders, roup in fowl, foul brood in bees, etc., etc.,—all calling for very careful, patient, and persistent investigation, with a view to answers and solutions that may be of value to the community.

The demand for instruction in bacteriology is also much greater than it was a few years ago, especially among dairy students; and the outcome of it all is, that we are at a standstill for lack of laboratory accommodation and suitable equipment both for instruction and investigation in this department. For want of sufficient room and the necessary appliances, we have to divide our dairy students into six sections, getting round the class only once a week; and as a consequence we are unable, during the session of the Dairy School, to give them anything like what they are asking for and really need to equip them for their work.

To put us in proper shape for the work demanded of us in this department, we should have at least $30,000 for a new laboratory, laboratory equipment, and an isolation stable for experimental work and the treatment of sick animals—precisely the sum which the Michigan Agricultural College is investing in a Bacteriological Laboratory, apart from equipment and isolation stable. I hope some good Canadian who has the ability and heart to do this thing for the farmers of Ontario, will come to our relief.

Prof. Harrison makes a number of personal visits to cheese factories and elsewhere in the Province, to assist cheese-makers and others who need assistance in matters connected with his department; and he announces in his last report that his services will, as far as possible, be at the disposal of cheese and butter makers, farmers, stockmen, and veterinarians who may require help on bacteriological lines.

Research. A large amount of research work is under way in the department, especially on dairy lines—

(1) A large quantity of milk was pasterurized at different temperatures for butter-making during the year, and the results were set forth in Bulletin No. 117, published by Professors Dean and Harrison a short time ago,—showing that 185° F. gives the best results in butter for export or to be put into cold storage.

(2) A good deal of work has been done on what is known as "bitter milk," which has given much trouble in some factories; and a bulletin on the subject will soon be published.

(3) Investigations on "Yeast and its Household Use" were published a short time ago in Bulletin 118.

See Prof. Harrison's report, Part X of this volume.

Field Experiments at the College and Co-operative Experiments Throughout the Province.

The work of the Experimental Department during the past year has included practical tests with farm crops on about 2,000 field plots; a heavy correspondence with farmers throughout Ontario; the presentation of the results of experiments through reports, newspaper articles, meetings of Farmers' Institutes, and farmers' excursions; and co-operation with the Ontario Agricultural and Experimental Union in carrying on experiments on about 3,000 Ontario farms

Field Experiments at the College. The market value of the wheat, barley, oats, and rye; the peas, beans, buckwheat, corn, and hay; and the potatoes, turnips, mangels, and carrots grown in Ontario annually is upwards of $100,000,000. The Experimental Department conducted upwards of 100 distinct experiments with farm crops in 1901, with the object of securing information which might be useful in increasing both the quality and the quantity of the farm crops of the Province. Each experiment was along some definite line which had been carefully thought out. Every test was conducted with great care, and the principal results of most of the experiments are presented in the report of the Experimentalist, Part XI of this volume. Even to enumerate the various field experiments and give the most important results therefrom would occupy several pages, and the reader is, therefore, referred to the summary of results presented in the report of the Experimentalist.

Co-operative Experiments in Agriculture. During the season of 1901, co-operative experiments were conducted by 1,185 experimenters on grain crops; 222 on root crops; 146 on forage crops; 180 on culinary crops; 66 on forage experiments; and 261 on other lines.

Both the financial and the educational results of this work throughout Ontario are of much value. The benefits are not confined to the experimenters themselves, but are shared by thousands of others who examine the growing crops, attend the annual meetings, read the annual reports, or become familiar with the results through the columns of the public press, in the meetings of the Farmers' Institutes, and in various other ways. For the results of the co-operative experiments in 1901, the reader is referred to the Annual Report of the Ontario Agricultural and Experimental Union.

Agriculture in Europe. The Experimentalist visited upwards of fifty of the leading Agricultural Colleges and Experiment Stations in nine of the countries of Europe within the past year. A few observations on the agriculture of the countries visited will be found in the report of the Experimentalist, Part XI of this volume.

Poultry Raising.

I have already spoken of the four weeks' Special Course in Poultry Raising, and may add here that the Regular Course students at the College in 1901 received the usual amount of instruction and practical training in this department.

Fattening Chickens. Our Poultry Manager has fattened and sold a large number of chickens during the past year—some to the College and a much larger number to dealers in Toronto and Montreal; and in the course of his year's work and experiments, he has obtained results which seem to warrant the following conclusions:

(1) That there is more profit in fattening chickens which weigh about $3\frac{1}{2}$ lbs. each when put into the crates, or slatted coops, than in fattening chickens which weigh 4 lbs., $4\frac{1}{2}$ lbs., or more. Birds under 3 lbs. each did well in the crates; but they were rather small to be fed by the cramming machine. Birds weighing $3\frac{1}{2}$ lbs. and those under 3 lbs. made a pound of gain much more cheaply than heavier birds.

(2) That in feeding chickens, the best results and most profit are got from feeding them *out of a trough* in slatted coops for the first two weeks and *by the cramming machine* the last ten days,—the birds being kept in the same coops for the last ten days, but being taken out at meal time (twice a day), fed by the machine, and put back into the coops.

The second best results are got by feeding from a trough in slatted coops for the full period of three weeks and three days, or thereabouts.

The least satisfactory results are got from birds allowed to run loose in a pen while they are being fattened. Those fed loose at the College made much smaller gains than those fed in the slatted coops, and the gains which they made cost nearly one-half more.

The Cramming Machine. Will it pay to buy a cramming machine for fattening chickens? Yes and no. *Yes,* if you are catering to the best market and wish to furnish the finest quality of fowl, especially if you are fattening birds that have been fairly well fed from the time they were hatched, as the greatest advantage from the machine is with birds that lose their appetite or go "off feed" to some extent after being fed in the coops for two weeks or so ; *No,* if you are feeding for ordinary market purposes and cannot very well spare the time, night and morning, for individual feeding with the machine.

Chickens such as we buy from farmers—usually quite thin when they come in—fatten very rapidly in the crates, or slatted coops ; and it would scarcely pay to buy a machine for feeding such chickens.

Egg Production in Summer. By careful tests made by our Poultry Manager last summer,—weighing and charging food, etc., and keeping strict count of eggs,—it was found that Andalusians, enclosed in a yard which was connected with a roosting house, produced eggs at a cost of five cents a dozen, and Plymouth Rocks at a cost of about 6 cents a dozen ; but, as the Rocks are much better winter layers than the Andalusians, it is probable that for the whole year they would make a better showing than the Andalusians.

Feeding Ducks. After careful experiment, our Poultry Manager, Mr. Graham, has come to the conclusion that nothing is gained by feeding ducks in crates or with the cramming machine—that ducks will grow and put on flesh just as fast when fed loose in a small yard as when put into crates or fed by the cramming machine,—in other words, that you cannot force into a duck's crop any more food than it will eat of its own accord.

See Mr. Graham's report, Part XII of this volume.

Bee-Keeping.

We have not a regular department of apiculture ; but we have a course of lectures (20 in number), with some practical demonstrations, delivered to our first year students in the Fall Term. The lecturer at present in charge of the work is H. R. Rowsome, of Burlington. Mr. Rowsome was a pupil of Mr. Holtermann's ; and I was pleased to notice that in the last course of lectures especially, he succeeded in securing the attention of the students and in arousing considerable interest in the subject of bee keeping.

For Mr. Rowsome's account of his work, see Part XIII of this report.

Military and Gymnastic Drill.

We do not devote much time to drill ; but we think that an hour a day for first and second year students during portions of the Fall and Winter Terms is well spent in setting the boys up and thereby improving both their appearance and their manners. We are fortunate in having Captain Walter Clark, an instructor so well and favorably known, for the work required under this head. He always secures the respect of the young men placed under him, and never fails to straighten them up and improve their general bearing.

Institute Excursions.

We had about the usual number of farmers' excursions in 1901—between 25,000 and 27,000 people—nearly all under the auspices of the Farmers' Institutes ; and I am glad to be able to report that the majority of those who visit the College year after year, come, not so much for an outing or mere amusement, as to learn something that may be of use to them in the work or management of their own farms. This explains their coming here for so many years in succession.

Class-Room Work.

The class-room work in the different departments of our College course has gone on as usual. A fair proportion of first and second year students gained a respectable

standing in our College examinations; but the percentage of failures is still very large, resulting in some cases from idleness, but in most instances from a lack of early training in the elementary branches of an English education.

The fourth year examinations were conducted by examiners appointed by the Senate of the University; and those of the first, second, and third years by the professors and instructors of the College.

Bachelors of the Science of Agriculture.

The usual examinations for the B.S.A. degree were held in the month of May; but owing to the change in the length of our course for this degree from three to four years, there was only one candidate—

Cumming, M., B.A .... Truro, Nova Scotia,
who passed *magna cum laude.*

Recipients of Associate Diplomas.

Atkinson, Alfred	Egmondville, Huron, Ont.
Broderick, F. W	St. Catharines, Lincoln, Ont.
Carroll, W. R.	Norwich, Oxford, Ont.
Cowle, W. G	Toronto, Ont.
Craig, H. A.	North Gower, Carleton, Ont.
Cutting, A. B	Truro, Nova Scotia.
de Coriolis, E G	Forest Side, Island of Mauritius.
*Delong, H. M	Brooklin, Ontario, Ont.
Dixon, C. H	Dromore, Grey, Ont.
Elderkin, D. T.	Ottawa, Carleton, Ont.
Everest, R. E	Scarboro' Junction, York, Ont.
Fairweather, A. W	Alma, Wellington, Ont.
Ferguson, Jas	Spring Hill, Carleton, Ont.
Galbraith, D. H	Ellesmere, York, Ont.
Galbraith, S. M	Ellesmere, York, Ont.
Gilpin, B. C	Gorrie, Huron, Ont.
Goodchild, A	Craigleith, Grey, Ont.
Gunn, W. H.	Ailsa Craig, Middlesex, Ont.
Higginson, J. A	Chilliwack, British Columbia.
Horton, D. H.	North Pelham, Welland, Ont.
Johnston, B. C.	Fairfield Plains, Brant, Ont.
Ketchen, A. P	Brucefield, Huron, Ont.
Klinck, L S	Victoria Square, York, Ont.
Murray, H.	Mabou, Nova Scotia.
McDonald, W. T	Teeswater, Bruce, Ont.
McLean, J	Ailsa Craig, Middlesex, Ont.
Newman, L. H.	Andrewsville, Lanark, Ont.
Partridge, A. W	Crown Hill, Simcoe, Ont.
Peart, H. S	Nelson, Halton, Ont.
§Reed, P. E.	Georgetown, Halton, Ont.
Rivara, J. B.	Buenos Ayres, Argentine Republic
Russell, J. M.	Freeman, Halton, Ont.
Rutherford, W. J	South Mountain, Dundas, Ont.
Sharp, T. H.	Spanishtown, Jamaica, Ont.
Shuh, C.	Waterloo, Waterloo, Ont.
Sutherland, A. T	Stratford, Perth, Ont.
Weekes, H. M	Glencoe, Middlesex, Ont.

*To take supplemental examinations in Veterinary Anatomy, Botany, and Api culture.

§To take a supplemental examination in Agricultural Chemistry.

First-Class Men.

The work of the College is divided into departments, and all candidates who obtain an aggregate of seventy-five per cent of the marks allotted to the subjects in any department are ranked as first-class men in that department. The following list contains the names of those who gained a first class rank in the different departments at the examinations in 1901, arranged alphabetically :

First Year.

Barber, T. C, Yorkton, Assa, in one department,—Physical Science.
Barton, H., Vankleek Hill, Ont., in one department,—Physical Science.
Colter, G L, Mouth of Keswick, N.B., in one department,—English and Mathematics.
Dewar, W. R., Fruitland, Ont, in three departments,—English and Mathematics ; Physical Science ; Biological Science.
Fulmer, H. L, Ruthven, Ont., in three departments,—English and Mathematics ; Physical Science ; Biological Science.
Houser, H. W., Campden, Ont., in four departments,—English and Mathematics ; Physical Science ; Biological Science ; Agriculture.
Johnston, J. M., Carlow, Ont., in one department,—English and Mathematics.
McCallum, J. M., Shakespeare, Ont., in three departments,—English and Mathematics ; Physical Science ; Biological Science.
Park, C. L., North Seneca, Ont., in one department,—English and Mathematics.
Paul, R. H., Bath, Ont., in one department ,—English and Mathematics.
Readey, J. C., Rosetta, Ont., in one department,—Physical Science.
Strachan, C. L., McKenzie, Man., in one department,—English and Mathematics.
Thom, C. C., Elma, Ont., in one department,—Biological Science.
Wilson, J., White Church, Ont., in one department,—Physical Science.

Second Year.

Elderkin, D. T., Amherst, N.S., in one department,—English and Mathematics.
Ferguson, Jas., Spring Hill, Carleton, in one department,—English and Mathematics.
Ketchen, A. P., Brucefield, Ont., in two departments,—English and Mathematics ; and Physical Science.
Klinck, L. S., Victoria Square, Ont., in one department,—English and Mathematics.
Patridge, A. W., Crown Hill, Ont., in three departments,—English and Mathematics ; Physical Science ; and Biological Science.
Russell, J. M., Freeman, Ont., in two departments,—English and Mathematics ; and Biological Science.
Rutherford, W. J., South Mountain, Ont., in one department,—English and Mathematics.

Scholarships.

Scholarships of $20 each in money were awarded for groups of subjects in first year work as follows :

Highest standing, with a minimum of forty per cent. of the marks for each subject and an aggregate of seventy-five per cent. of the total number of marks allotted to the subjects in the group—

I. English, Mathematics, Book-keeping, and Drawing,—*H. L. Fulmer.*
II. Mechanics, Physics, Chemistry, and Geology,—*W. R. Dewar.*
III. Botany, Zoology, Horticulture, and Apiculture,—*J. M. McCallum.*
IV. Agriculture, Poultry, Dairying, and Veterinary Science,—*H. W. Houser.*

Prizes.

Prizes were given as follows :

Essay on "The Best Models of Victorian Prose Literature : Their Leading Characteristics Compared with those of their Most Noted Contemporaries and Predecessors."—$10 in books to *Jas. Ferguson*, Spring Hill, Carleton, Ont.

First place in general proficiency on first and second year work, theory and practice,—$10 in books to *H. M. Weekes*, Glencoe, Middlesex, Ont.

Highest standing in general proficiency with first-class honors in one department at the University Examinations for the B. S. A. degree,—$10 in books to *M. Cumming*, Amherst, N.S.

GOVERNOR-GENERAL'S SILVER MEDAL.

Highest in general proficiency, second year, 1900 1901. *A. W. Partridge*, Crown Hill, Simcoe, Ont.

ONTARIO AGRICULTURAL COLLEGE,
Guelph, December 31st, 1901.

JAMES MILLS,
President.

FINANCIAL STATEMENT FOR 1901.

I. COLLEGE EXPENDITURE

(a) College Maintenance.

1. *Salaries and Wages*		$22,899 60	
2. *Food:*			
Meat, fish, and fowl		5,173 97	
Bread and biscuit		979 13	
Groceries, butter, and fruit		5,637 00	
3. *Household Expenses:*			
Laundry, soap, and cleaning		319 50	
Women servants' wages		1,932 81	
4. *Business Department:*			
Advertising, printing, postage, and stationery		1,139 60	
5. *Miscellaneous:*			
Maintenance of Chemical Laboratory		406 81	
" Physical "		349 28	
" Biological "		372 32	
" Bacteriological "		348 04	
Library, reading room, books, papers, and periodicals		838 55	
Scholarships		123 25	
Unenumerated		1,003 01	
Temporary assistance		85 14	
Experiments in soil physics		100 00	
			$41,708 01

(b) Maintenance and Repairs of Government Buildings.

Furniture and furnishings		1,257 22	
Repairs and alterations		1,073 72	
Fuel		4,481 47	
Light		1,273 81	
Sewage disposal		427 13	
Unpaid accounts		369 87	
			8,883 22
			$50,591 23

College Revenue.

Fees		$3,110 95	
Balances on board account, after deducting allowances for student labor		7,456 08	
Gas used by students in laboratories		120 00	
Supplemental exams		10 00	
Sale of tuberculin		5 40	
Contingencies		8 85	
			10,711 28
Net expenditure for year			$39,879 95

II. FARM EXPENDITURE.

(a) Farm Proper and Experimental Feeding.

1. *Permanent Improvements*		290 54	
2. *Maintenance:*			
Wages of foremen and men	3,341 45		
Live stock—Cattle for feeding, etc	4,079 63		
Maintenance of stock	1,403 22		
Seeds	231 09		
Binding twine	....		
Repairs and alterations, blacksmithing	453 54		
Furnishings	196 78		
Tools and implements	196 94		
Advertising, printing, postage, and stationery	42 65		
Fuel and light	34 73		
Experimental feeder	360 00		
Contingencies	174 75		
		$10,514 78	
			$10,805 32

Revenue.

Sale of Cattle ;			
4 steers, 4,660 lbs. at $3 85	179 40		
2 " 2 540 " 4.50	114 30		
22 " 29,400 " 5.25—$1.20 weighing	1,542 29		
6 " $44.00 each	264 00		
6 cows	258 00		
1 steer	36 00		
1 pure bred calf	80 00		
2 grade calves	5 50		
		2,479 49	
Sale of Pigs :			
3 hogs, 1,570 lbs. at $4.00	62 80		
1 " 640 " 4.25	27 20		
1 " 396 " 4.50	17 82		
1 " 134 " 5.00	6 70		
12 " 2,036 " 5.25	106 89		
18 " 3,227 " 5.50	177 48		
24 " 4,608 " 6.00	276 48		
8 " 1,440 " 6.15	88 56		
11 hogs, 2,901 lbs. at $6.50	123 56		
11 " 2,022 " 6 60	133 45		
39 " 7,193 " 7.00	503 50		
33 " No weights	559 00		
		$2,083 44	
Sale of Sheep and Lambs :			
97 lambs, 11,765 lbs. at $4.75	$558 82		
7 " No weight	40 00		
		598 82	
Sale of Wheat :			
17 bush. at 66c	$11 22		
		11 22	
Sale of Ensilage :			
6,800 lbs. at $2.00 per ton	$6 80		
		6 80	
Sale of Hay :			
400 lbs. at $10 per ton	$2 00		
		200	
Sales of Milk :			
4,150 lbs. at 85c. per cwt.	$35 27		
3,185¼ quarts at 4c	127 41		
		162 68	
Sales of Wool :			
290 lbs. unwashed wool		23 96	
Sales of Hides and Skins :			
8 sheep skins		7 65	
Sales of old Horses (2)		55 00	
Service of Animals		214 00	
Sale of Old Iron		1 65	
Sale of Feed		332 20	
Sale of Wool Refuse		90	
			5,979 81
Net expenditure, allowing nothing for supplies to College, feed for dairy stock, keep of horses for College and other departments, etc., etc.			4,825 51

NOTE.—This statement includes only the cash transactions of the year. A profit and loss statement of the Farm Proper will be found in Prof. Day's report, Part VIII of this volume, p. 66.

(b) Field Experiments.

Permanent improvements		$77 50	
Experimentalist—salary	$1,500 00		
Foreman—salary	470 00		
Teamsters—wages	570 00		
Other laborers—wages	2,107 90		
Seeds	364 10		
Manure	103 60		
Furnishings and repairs, blacksmithing, etc	308 15		
Printing, postage and stationery	64 44		
Implements and tools	63 68		
Contingencies	422 35		
		5,974 22	
Net expenditure on field experiments			$6,051 72

III. DAIRY DEPARTMENT.

(a) Dairy School.

Wages of instructors	1,385 00		
Engineer (3 months)	90 00		
General helper (3 months)	75 00		
Board of engineer	30 00		
Furnishings, repairs, painting, etc	189 61		
Dairy appliances	255 75		
Fuel and light	249 68		
Advertising, printing, postage. and stationery	132 27		
Books, papers, etc	1 75		
Expenses of Judges	16 50		
Expenses of inspecting factories	15 97		
Milk for use in school	2,728 58		
		$5,255 31	
Revenue.			
Fees	$51 00		
Sales of Butter:			
8,169 lbs. at from 15 to 24c	1,806 58		
Sales of Cheese:			
4,633½ lbs. at from 8 to 10½c	458 58		
Sales of Skim-milk and Whey:			
21,050 lbs. skim-milk at 10c. per 100 lbs	21 05		
whey—season's make	10 00		
Sales of Cream:			
5 quarts at 20c	1 00		
Contingencies—breakages	5 40		
Sales of Milk, Buttermilk, and Starters	1 77		
		$2,355 38	
Net expenditure			,899 9

(b) Experimental Dairy.

Foreman (9 mos.)	447 50		
Cheesemaker (9 mos.)	499 95		
Assistant in experimental work (9 mos.)	270 00		
Wages of cattlemen, etc	570 74		
Purchase of milk for experiments	3,072 34		
Cows	596 65		
Feed and fodder	646 12		
Furnishings and repairs	562 21		
Fuel and light	573 36		
Laboratory expenses, chemicals, etc	65 65		
Contingencies	208 63		
Advertising, printing, postage, and stationery	76 55		
		7,589 70	
Revenue.			
Sales of Butter:			
16,428½ lbs. at from 13c to 23c	3,354 94		
Sales of Cheese:			
5,627¾ lbs. at from 5c to 11c	528 52		
Sales of Milk:			
57,240 lbs. at from 97c to $1 per 100 lbs	567 63		
1,202¾ quarts at 4c per qt	48 11		
Sales of Skim-milk and Whey:			
40,640 lbs. of skim-milk at 10c per 100 lbs	40 64		
Sales of Cream:			
316 quarts at from 15c to 22c	52 10		
Sales of Cattle:			
15 grade calves, sold when a few days old	42 25		
13 grade cows	335 50		
Refund of Expenses	2 45		
Sales of 2 Cow Hides	6 25		
Sales of old Wagon and old Buggy	25 00		
Sales of Buttermilk	20		
		5,003 59	
Net expenditure			2,595 11

IV. POULTRY DEPARTMENT.

Salary of manager	700 00		
Temporary assistance	295 33		
Purchase of stock	80 74		
Furnishings, repairs, etc	175 65		
Feed, etc	327 19		
Fuel, light, and contingencies	123 40		
Experiments in fattening poultry	486 50		
		2,188 81	

REVENUE.

Sales of Eggs :			
For hatching, 62 sittings at $1.00	62 00		
" 31 " $1.50	46 51		
For domestic use, 738 doz. at 10c to 25c per doz	110 69		
		219 20	
Sales of Poultry :			
Sales of live birds at from 75c to $5.00	114 53		
" dressed poultry at from 7½c to 12c per lb	350 05		
Sale of feathers	80		
" old box	40		
		465 78	
			684 98
Net expenditure			1,503 83

V. HORTICULTURAL DEPARTMENT.

Permanent improvements	174 94		
Maintenance :			
Salary of head gardener and foreman	700 00		
Salary of assistant gardener and florist	540 00		
Salary of assistant in greenhouses	380 00		
Teamster	360 00		
Wages of laborers	1,452 23		
Manure and fertilizers	92 95		
Seeds, bulbs, plants, trees, etc	559 80		
Furnishings, repairs, implements, and tools	271 96		
Fuel and light	751 27		
Contingencies	168 97		
		5,277 18	
		$5,452 12	

REVENUE.

Sale of Onions	50		
" *Strawberries*	1 00		
" *Fruit Trees*	19 82		
		21 32	
Net expenditure			5,430 80

Note.—Ordinarily there is no revenue from this department, as the produce is used by the College; and, because of complaints from Guelph market gardeners, the department is not allowed to sell even the surplus.

VI. MECHANICAL DEPARTMENT.

Salary of foreman	700 00	
Tools, fuel, and light	99 97	
		$799 97

SUMMARY.

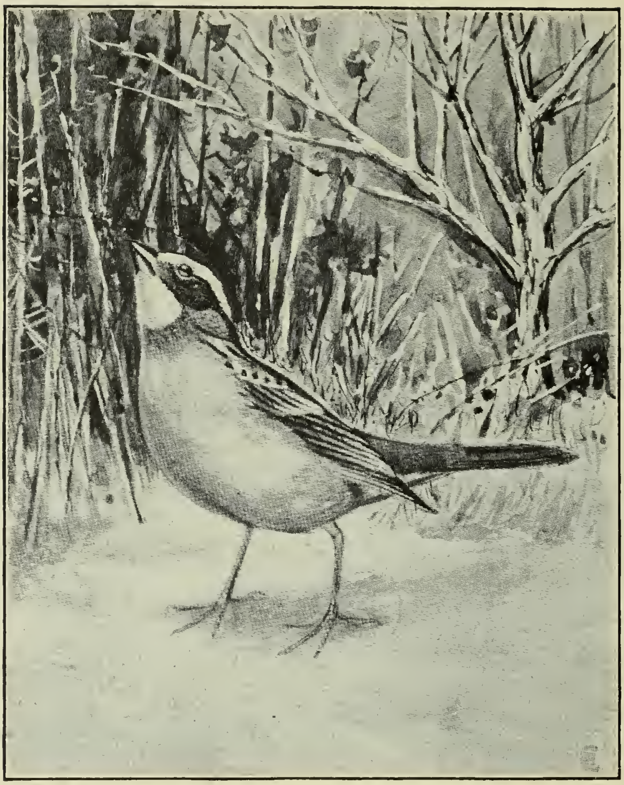
Total net expenditure :		
I. College and Government Buildings	....	39,888 80
II. Farm :		
1. Farm proper and Experimental Feeding Department	4,825 51	
2. Field Experiments	6,051 71	
		10,877 23
III. Dairy Department :		
1. Dairy School	2,899 93	
2. Experimental Dairy	2,595 11	
		5,495 04
IV. Poultry Department	....	1,503 83
V. Horticultural Department	....	5,430 80
VI. Mechanical Department	....	799 97
Total net expenditure in 1901	....	$63,995 67

JAMES MILLS,
President.

Main Building and Chemical Laboratory.

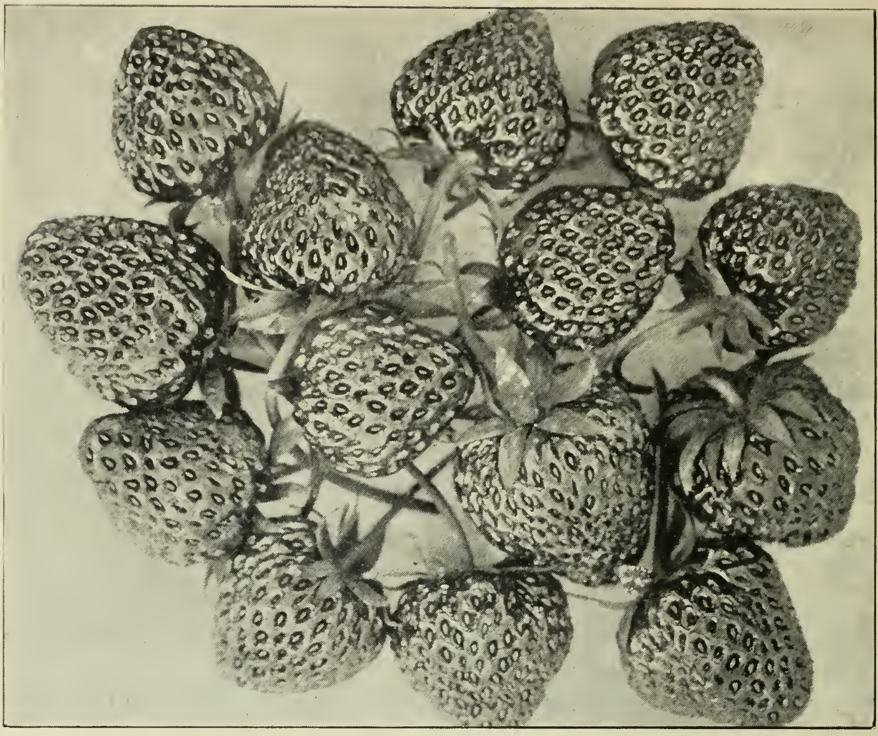
Experimental Department Building and Bacteriological Laboratory.

Barn and other Farm Buildings.



Tree Sparrow —(*Spizella Monticola.*) p 31.

WHITE THROATED SPARROW.—(*Zonotrichia albicollis.*) P. 31

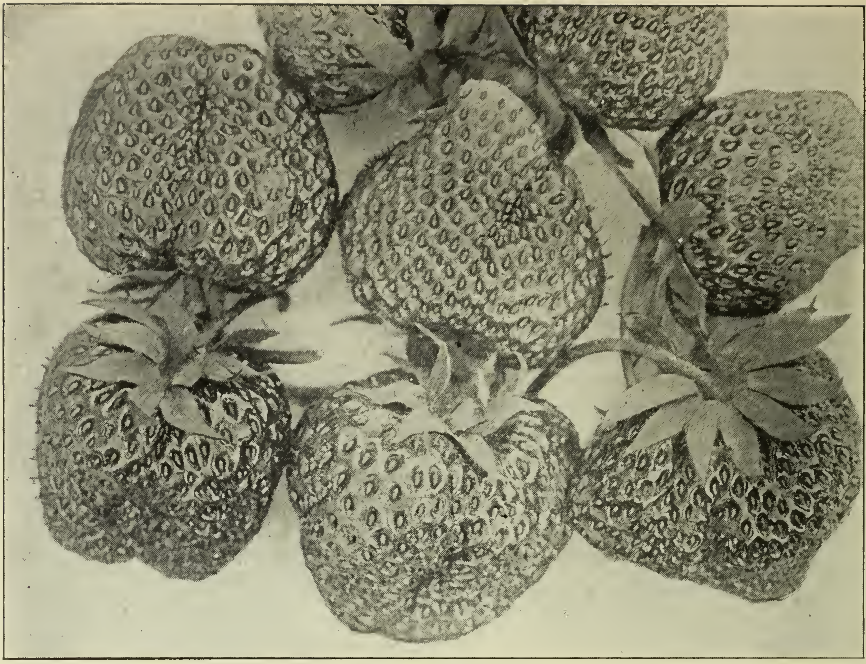


SADIE. P. 69

WESLEY. P. 69.

Van Deman. p. 69

Clyde. p. 69



TENNESSEE PROLIFIC. P. 69

SAUNDERS. P. 69

PART II.

REPORT OF THE PROFESSOR OF PHYSICS.

To the President of the Ontario Agricultural College :

SIR,—I have the honor to present herewith my report on the work in the departments of English Literature and Physics.

REPORT ON THE WORK IN ENGLISH.

Some slight changes in the work in English have been introduced this year. More prose authors and fewer poetical authors are being studied, the prose being read principally as models of style. Also, text-books on Rhetoric have been adopted in all the classes, with a view to making the study of rhetoric and composition more definite and exact.

Public Speaking. The importance of public speaking is being practically recognized on all sides. The College Literary Society, previous to this year, formed one body. This year, the Society has been divided into three sub-societies, each meeting once a week. The constitution of the Society provides for special encouragement of public speaking. This departure, added to the methods previously in vogue among the students, has already given markedly good results.

Perhaps nothing has produced better results in the way of public speaking than the organization of a class, as part of the regular college work, for special instruction in declamation and debating. Mr. Cumming has charge of this class, and his well-known ability as a speaker, together with his first-rate scholarship, makes him specially fitted for the work. As might have been expected, the best possible results have been realized.

INSTRUCTION IN PHYSICS.

During the last year or two the instruction given to the classes in Agricultural Physics has unavoidedly suffered a relapse. Our accommodation for lectures and laboratory work has always been small, and the rapid increase in numbers during the last two years has made the class-room and the laboratory altogether too small and inadequate. Consequently, last year some of the most important parts of the practical work in Physics were omitted. Through the liberality of the Legislature, however, this department will soon be amply accommodated. In the new building there will be provided for Physics one large laboratory capable of accommodating 50 or 60 students, two smaller ones, a class-room and two offices.

With regard to assistance, by appropriating part of the grant intended for maintenance of the laboratory supplies, supplemented by a generous allowance by yourself from the general college funds, I have been able to retain the services of an assistant continually through the year. Mr. R D. Craig, B.S.A., remained with me until September, when he left for Cornell to pursue a post-graduate course. Since his departure I have been assisted by Mr. G. B. McCalla, B S.A. Both of these gentlemen have rendered capable assistance in the work of this department.

INVESTIGATIONS UNDERTAKEN.

A partial report of the various investigations undertaken by the Department of Physics is submitted herewith. Some work has been done on soil temperatures, especially as affected by cultivation. But our results are narrow and indefinite, and require to be supplemented by further investigations before being published. Facts concerning destruction by lightning have been collected from a large number of observers

over the Province. The alarming increase in the destruction of barns by lightning, as reported by various insurance companies and some questions from correspondents, suggested this investigation.

There is also a report on the Hanrahan Cold Storage. This system has given excellent results, both in temperature and humidity. An even temperature has been maintained, with a gradual rise as the season advanced. No dripping from the ceiling, or mould on the lining of the refrigerator or on the products stored has been observed. With regard to absorption of objectionable odors, the system has been as efficient as should be expected; nevertheless, it has not been by any means so perfect in this respect as the originator claimed it would be. It is unscientific to look for perfectly pure air in a storage room where there is *circulation* only. Pure air is possible only with *ventilation*, that is, the frequent introduction of fresh air from an outside source.

A simple and inexpensive plan of ventilation has been put into operation at the farm stables. In consultation with Prof. Day, whose especial duty it was to consider the cost of carrying out the proposals, I prepared the plans, the gist of which may be found toward the end of the report.

Destruction by Lightning in Ontario, 1901.

Early in the year we distributed the following circular as widely as possible over Ontario, principally among students and ex-students of the Ontario Agricultural College, and newspaper and fire insurance offices:

Loss by Lightning.

Date of storm.......................................190 ; hour of day..........................M.
Where loss occurred.......................Township..............................Co..................
On whose premises? ....
Kind of building struck?...
Of what constructed (wood, brick, or stone)? ....
Kind of roof (shingle, slate or metal)? ....
If building burned, how much loss? .... $ ....
Value of contents burned?..$...................................
If struck and not burned, how much damage? ....$...................................
Was it provided with lightning rods? ....
If so, what metal was used? ....
What were the dimensions of the building? Height..............length..............width ....
Was it isolated, or was it near trees, single or in groups?..
....

Live Stock Killed in the Field.

Date of storm and locality ....
Kind of stock .... ; number........................
Amount of loss.. $ ....
Was the stock near a wire fence? ....
If near fence, were ground wires used? ....
Was the stock in the open field? ....
Was the stock under shelter of any kind? ....
If sheltered, how? ....

Trees Struck by Lightning.

Date of storm and locality ....
Kind of trees .... ; number........................
Situation: Single, in group, or in forest ....
If grouped, relative height of tree, high or low...
Nature and extent of damage..
Name ....
Post Office Address ....
To be filled up and returned to Department of Physics, O.A.C., Guelph, Ont.

The object in view was to discover if possible the conditions of liability to lightning stroke; for persons and animals, in what circumstances of shelter there is least danger; for buildings, what sorts of protection are efficient, especially as regards trees, lightning rods, and grouping of buildings.

In all 130 reports have been received, and the information conveyed is classified below.

TABLE 1.—*Buildings struck and burned, wholly or partially.*

Circumstances.	Dwellings.		Churches.		Barns.	Stables.	Town Buildings.	Loss.
	Brick.	Frame.	Brick.	Frame.				
								$ c.
Isolated	....	....	1	....	18	....	....	35,750
Near trees	....	2	...	......	8	....	....	8,820
Near other buildings	....	1	....	.. .	....	1	1	2,400
Total	....	3	1	....	26	1	1	$46,970

Of the 32 buildings thus reported as burned, wholly or in part, four of the barns are reported as provided with lightning rods, and on two of these the rods were out of repair.

With regard to the two barns provided with lightning rods, additional information was obtained. The report given by Mr. A. King, Plattsville, whose barn was struck on May 2nd, is subjoined :

"The lightning apparently came down the rod nearly to the ground, and then left the rod and went through the wall two feet thick, shaking the foundation for several feet. Directly inside a row of cattle were lying. The stroke killed four head, two on either side where the bolt came through the wall. I dug down to see if the rod was in the ground a proper depth. The rod was put about one foot under ground at the wall, ran out about four feet and then went down several feet. I dug over three feet, and it was further down yet. When they put up the rod they made coil twist in rod to take up the spare length to get rid of it. I don't know whether that would affect current or not."

On June 12th, the barn belonging to Mr. Isaac Linton, Brooke Township, Lambton County, was struck and burned. This barn had recently been provided with lightning rods. The Farmers' Sun made inquiry of the Insurance Co. and obtained a report, which we take the liberty of quoting here :

"The large barn of Isaac Linton, jr., lot 10, con. 9, Brooke, was struck by lightning and burned to the ground on the night of the 12th June last. The building had been rodded only a few hours previously—that is, on that day. The terminals of the rods were in water. The wires on the roof and sides of barn were held in place by an X shaped clip, the lower points of which were nailed to the roof and boards by ordinary nails, and the upper points closed around the wire. No insulating material was in this clip or around the wire, to prevent the electric fluid from leaving the wire and following clip and nails into the barn. The iron braces to upright rods were fastened to the roof in a similar way. Our Company has paid Mr. Linton his insurance, but we are not satisfied that this way of putting up lightning-rods is a safe way, and would like to have the opinion of others on it."—W. G. WILLOUGHBY, Walnut.

These two cases of rodded buildings being struck, although the rods were apparently in good repair, present certain features worthy of note. In the one barn, a *coil twist* had been made in the rod to take up the surplus length. There was also *a bend* in the same wire below ground, and near the wall. On the other barn, *no glass or other insulator* had been placed between the rod and the points on the building to which the rod was attached.

All these features cannot be too strongly condemned. I am confident that lightning rods, properly installed, afford a fair measure of protection. But so long as their installation is in the hands of uninstructed and irresponsible agents, lightning rods cannot be recommended with any degree of confidence. Every person, however, who decides to have rods placed on his buildings can act as his own inspector, and thus insure for his buildings some degree of protection. He should insist :

1. That there be not fewer than five points, terminals of the rods, on the building. The more the better. The points should be plated, or otherwise prevented from rusting.

2. That copper or iron rod be used. If copper, the rod should weigh about 6 ounces to the foot ; if iron, about 35 ounces to the foot.

3. That there be no sharp bends to the rod.

4 That all joints be thoroughly soldered.

5. That glass or other insulator be placed between the rod and the building at each point of attachment.

6 That the lower end of the rod extend into perpetually moist earth or water. The depth necessary to secure perpetually moist soil will depend upon the character of the soil and upon the locality, whether low or elevated.

7. That the ground end of the rod be spread out, broom-like, either by unravelling and separating the strands of the rod, or by attaching a number of branches.

8. Afterwards, that the rods be frequently inspected to see that they are in good repair in all the above particulars.

Of the total number of buildings, 86, reported struck during the season, the frequency for each kind of building is indicated below in percentage :

TABLE II. *Showing percentage of different kinds of buildings struck in 1901.*

Barns	with season's crop	43	
	empty	22	65
Stables			6
Isolated dwellings			17
Churches			5
Town buildings			7

65 per cent. of the total number of buildings struck were barns ; from Table I it may be seen that of the total number struck and burned, 80 per cent. were barns ; and of the total number of barns struck, 66 per cent. contained the season's crop.

These facts are of serious import. The barns, the storehouses of our wealth, appear to be specially liable to lightning stroke, and liable to total destruction in even a greater degree than other buildings ; and especially liable at that season of the year when the barns are filled with hay and grain.

With incomplete data at hand, it is perhaps premature to attempt to explain these serious facts. Still there are certain plain conditions that undoubtedly aid in effecting these results *First*, barns are nearly altogether built of wood, and therefore more likely to be burned if struck than buildings constructed of brick or stone. *Secondly*, barns are as a rule more isolated, and apart from trees, than other buildings. *Thirdly*, the crops of hay, grain, and straw filling the barns do in themselves, in all probability, afford by the heat and gases that they evolve, an inviting path for the lightning stroke. At the same time, the stored crops furnish at every point highly inflammable material to which a flash might set fire, and, therefore, a barn when struck is more liable to be burned if this inflammable material is at hand.

Protection of Barns from Destruction by Lightning.

This liability of barns to destruction is not altogether inevitable. With our present knowledge, the danger cannot be altogether avoided, but it can be lessened by certain precautionary and protective measures.

1. *Planting of Trees.* Trees, if too close to a building, may be a source of danger, on account of side flashes. Yet there is good reason for believing that trees, the more the better, serve to relieve the electric tension of the atmosphere in times of storm, even though no one tree may receive a destructive charge. In this case the charge is distributed harmlessly through numerous channels to earth, instead of being concentrated into one destructive flash, as happens when a single isolated object receives the charge. For the same reason, groups of buildings are mutually protective.

2. *Lightning Rods.* The evidence afforded by our reports is negatively in favor of lightning rods. We have at hand no data in regard to the proportion of barns in Ontario that are provided with rods. Therefore, we cannot pronounce upon the relative security of barns so provided. But, as has already been stated, only four rodded barns were struck ; of these, two of the rods were out of repair ; and in the erection of the other two the ordinary rules of safety were disregarded. If lightning rods are put up, not according to the fancy or the convenience of the agent who sells them, but in a manner approved by a properly instructed and impartial person, they will afford not absolute security, but a reasonable measure of protection. In fact, barns especially, with their excessive liability to lightning stroke, should be provided with some form of protection.

In the erection of galvanized iron eave troughs on a barn, these troughs might well be utilized as lightning conductors. They would require to be connected with care, insulated from the building, (which they should be in any case), and continued into the cistern or connected by wire to moist earth.

TABLE III. *Stock Killed.*

Circumstances.	Horses.	Cattle.	Sheep.	Hogs.	Value.
Under Trees. Maple		1			$ 40
Under Trees. Pine		1			50
Under Trees. Elm	1	2			190
Under Trees. Poplar		1			65
Under Trees. Beech	1 (tree not struck)				40
Under Trees. Orchard		1 (calf)			10
Under Trees. Not specified	3	12	6		765
By straw stack				1	10
Near water pipe from barn		1			45
In shed	2				140
In basement stable		5			153
Near wire fence		1			40
Near rail fence		1			150
Without shelter	4	7	1		532
Total	11	33	7	1	$2,230

Trees Struck.

Kind and Number of Trees. Pine.	Elm.	Basswood.	Hemlock.	Maple.	Oak.	Chestnut.	Situation.	Nature and Extent of Damage.
3							Isolated	1 slightly damaged. 1 smashed. 1 burned and splintered
2							In clump	Not specified.
2							In forest	Split and killed.
1							15 rods from barn	Not specified.
	6						Isolated	4 not specified. 1 destroyed. 1 large branch torn off
	1						In clump	Not specified.
		2					Isolated	Not specified.
		2					Standing together in open field	1 cracked. 1 completely shattered.
		1					In forest	Not specified.
			2				On edge of forest	Not specified.
				2			Isolated	1 destroyed. 1 not specified.
					1		Isolated	Splintered, bark peeled.
						1	Isolated	Splintered.
8	7	5	2	2	1	1		

Reports from the United States emphasize the danger of wire fences. There is doubtless danger from this source, although the above figures do not emphasize it. This may be because of the fact that there are relatively fewer wire fences in Ontario, the old rail fence not having been supplanted as yet. This form of danger can be lessened or prevented. An animal standing near a wire fence during a thunder storm may receive a charge, because the fluid finds the easiest path to the ground through the body of the animal. Such would not be the case if the strands of the fence were connected by ground

wires to earth. At intervals of 400 or 500 feet a wire should be clamped closely to the several strands of the fence and run into the ground several feet as a lightning rod would be. This plan is simple and inexpensive, and should be adopted on all wire fences.

Persons Struck

Number.	Circumstances.	Extent of Injury.	Remarks.
1..........	In yard, under wire clothes-line.......	Killed........................	Si lefl ι h from wire to nose
4..........	In house..............................	Slight y injured...........	
1..........	On hay-rake in field	Killed	
2..........	In open field c rrying hoes	{ 1 killed .... Other slightly injured...	
1....	Undertree..............................	Kiled....	
2..........	In porch of church.....................	{ One killed, the other stunned......	
11			

Cold Storage.

Last year a model Cold Storage House, after the Hanrahan system, was erected at the College. During the year, the Dairy and Poultry departments have made use of the refrigerator for experimental purposes At my request, account was kept of the amount of produce stored and of the temperatures of the different articles when placed in cold storage. Also, a daily record was kept of outside and inside temperatures. At the end of the season the amount of ice consumed and the amount of refrigeration performed being known, a factor has been obtained stating the effectiveness of the walls of the ice-house in excluding the external heat. This factor is called the radiation co-efficient, and is obtained as follows:

Radiation through walls of Cold Storage House. First, the amount of ice required to cool the products stored was calculated.

For the butter and cheese stored during season..............	1,730 lbs.
For the poultry and eggs stored..........................	138 "
Total...	1,868 lbs.

The latter amount was subtracted from the total number of pounds of ice consumed during the season, 126,720, giving a remainder of 124,852 pounds This amount of ice was consumed by the heat radiated through the walls, and depends upon three conditions:

1. The total areas of the walls, floor, and ceiling of the ice-house and refrigerator. (See plans, Figs. 2 and 3)
2. The difference between the outside and inside temperatures.
3. The character of the walls, floor, and ceiling with respect to insulation.

Suppose the walls were of such a character that a unit of heat (the amount of heat required to raise 1 pound of water 1 degree in temperature) would pass through each square foot of wall surface in 24 hours for each degree of difference between outside and inside temperatures; then if A be the total areas of the walls, floor, and ceiling, and D be the difference between the outside and inside temperatures, the amount of heat radiated through the walls inward in 24 hours would be $A \times D$; hence the number of pounds of ice consumed by the heat would be $\frac{A \times D}{142}$, since to melt 1 pound of ice requires 142 units of heat; and if this factor, $\frac{A \times D}{142}$, were calculated for each 24 hours of the season, and the results added, we should have a number expressing in pounds the amount of ice consumed for the season, with a unit coefficient of radiation. Dividing this number by the amount actually consumed would give us the true coefficient of radiation. For the refrigerator, for the season.

$$\frac{A \times D}{142} = 14{,}640 \text{ pounds of ice.}$$

For the ice-house

$$\frac{A \times D}{142} = 41{,}317 \text{ pounds of ice}$$

Total 55,957 pounds of ice.

The total number of pounds of ice consumed by this means was, as above stated, 124,852 ; therefore, the radiation coefficient $N = \frac{124{,}852}{55{,}957} = 2.23$.

This factor holds true for all buildings, large or small, built after this pattern. Hence, by means of this factor, it is easy to calculate the amount of ice required to keep a refrigerator of given dimensions going, allowing of course a small percentage for cooling the products stored.

It may be noticed that of the total amount of ice consumed, only 1.5 per cent. was consumed in cooling the products stored ; all the rest was used up, practically wasted, by the heat from the outside. If a wall had been constructed in this instance that would allow no heat to pass through, only one ton of ice, instead of over 60 tons would have been required. Hence the *economy of good insulation.* Much less ice is used where insulation is good.

Not only that. I visited this year a refrigerator cooled by ice where the temperature was held between 34 degrees and 36 degrees through the entire season,—3 degrees or 4 degrees lower than the temperature in the refrigerator here. The difference is a matter of insulation. The insulation of the College Cold Storage is *good* ; that in the other to which I refer is *better*. On the other hand, the latter costs more in building.

Circulation of air in Cold Storage. Many refrigerators are well insulated, and provided with plenty of ice, but have little or no provision for air-circulation. There are two methods of cooling or refrigerating a room, as well as of heating. A room may be heated by radiation from a steam or hot water radiator : or it may be heated by bringing warm air into the room and allowing the cold air to pass out. Similarly a room may be cooled by placing ice in a box within or above the room or by placing therein pipes carrying some refrigerating substance ; that is, by radiation ; or it may be cooled by bringing cold air into the room and allowing the warm air to pass out.

For refrigeration, air circulation is better for many reasons than radiation. Those who have built cold-storage houses in recent years have been aware of the advantages of air-circulation, but many have been ignorant of the principles. In cases where principles of circulation are disregarded, the circulation is defective, and poor results have been obtained ; consequently, cold storage has been discredited, when a few slight changes in the details of the building would have given satisfactory results.

The Diagram I. (Fig. 1), shows the improper method, too often found, of providing for air-circulation between the ice storage above and the refrigerator below. It will be observed that there are spaces left between the walls and the floor of the ice chamber, through which the air is expected to flow. But the question is, which way will the air flow, from left to right, or from right to left? The air must flow down through one space and up through the other, or else there will be opposite currents meeting and conflicting. As there is nothing in the construction of the building to give a definite direction to the air-currents, the air will move sluggishly, or not at all.

It is well known that when moisture-laden air comes into contact with a cold surface, the moisture is condensed on that surface in the form of minute drops.

This happens in a refrigerater when the air, laden with moisture from the fruit, butter, cheese or meat stored in the room, touches the cold ceiling beneath the ice-chamber. Moisture is condensed on the ceiling, and hence the objectionable "dripping" so common in refrigerators.

Various devices are resorted to in order to prevent this dripping. Sometimes lime is scattered over the floor or salt of some kind kept in pans or troughs in the room, to absorb the moisture. In a room cooled mechanically by expansion pipes placed in the room, the moisture condenses on the pipes. If the pipes are cold enough, the deposit is in the form of hoar frost, which gathers about the pipes until a thick coat is formed, interfering with the cooling effect of the pipes. Then, if the machinery stops or the room warms up, the frost on the pipes melts, and the articles stored are deluged with the drip.

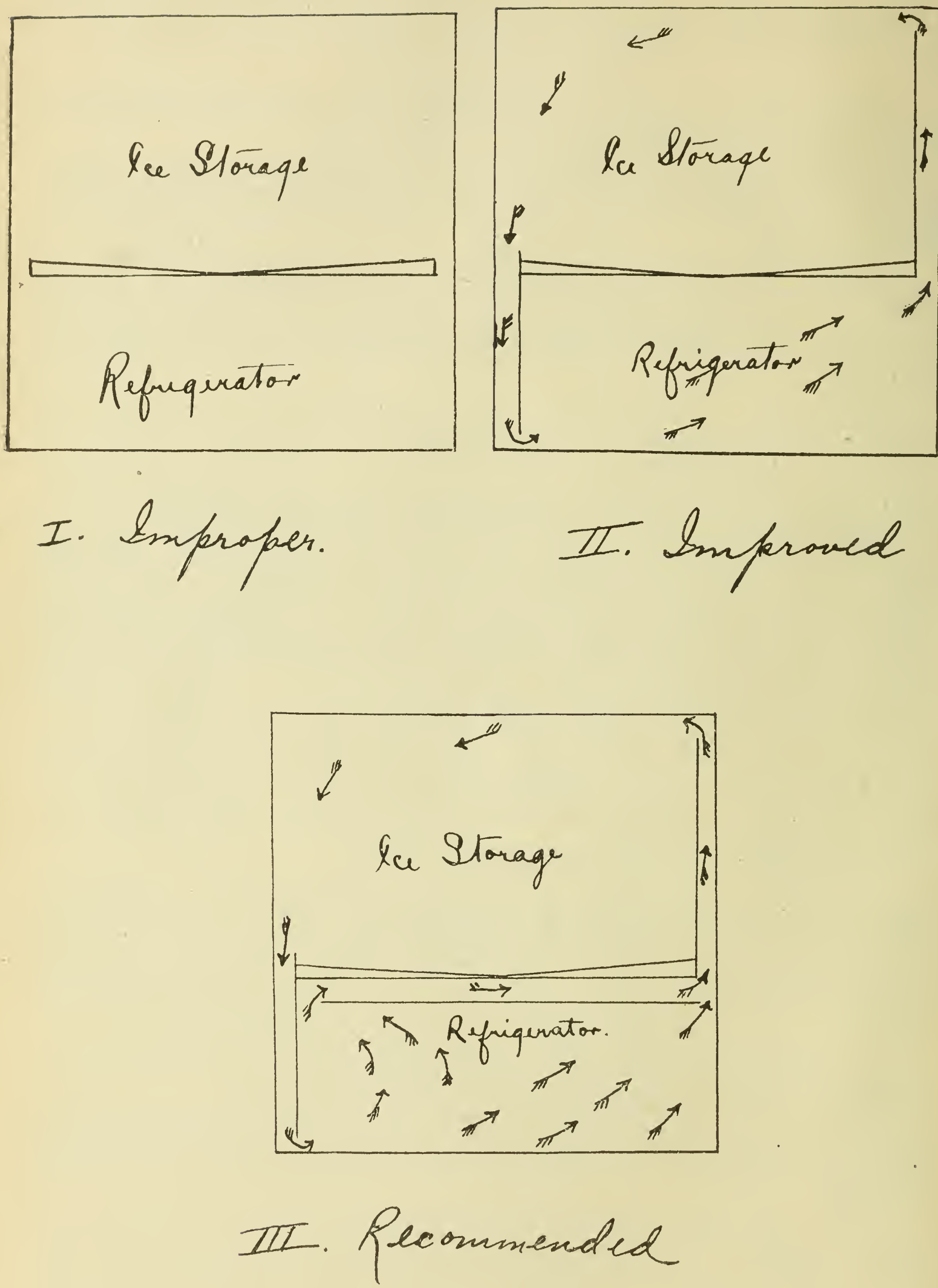


FIG. 1.—Diagrams showing proper and improper methods of providing for air-circulation in refrigerator,

Diagram II. showing an improvement over I. In II. a passage open at top and bottom, extends in depth from the floor of the ice-chamber to a point near the floor of the refrigerator, and in width across the side of the refrigerator. On the opposite side a similar passage extends from the ceiling of the refrigerator nearly to the ceiling of the ice chamber. The cold air comes down the first passage and the warm air leaves the refrigerator by the second. The suggestion for this plan of air-circulation is drawn from Nature, for it is a partial imitation of the convectional circulation of the atmosphere, which causes winds.

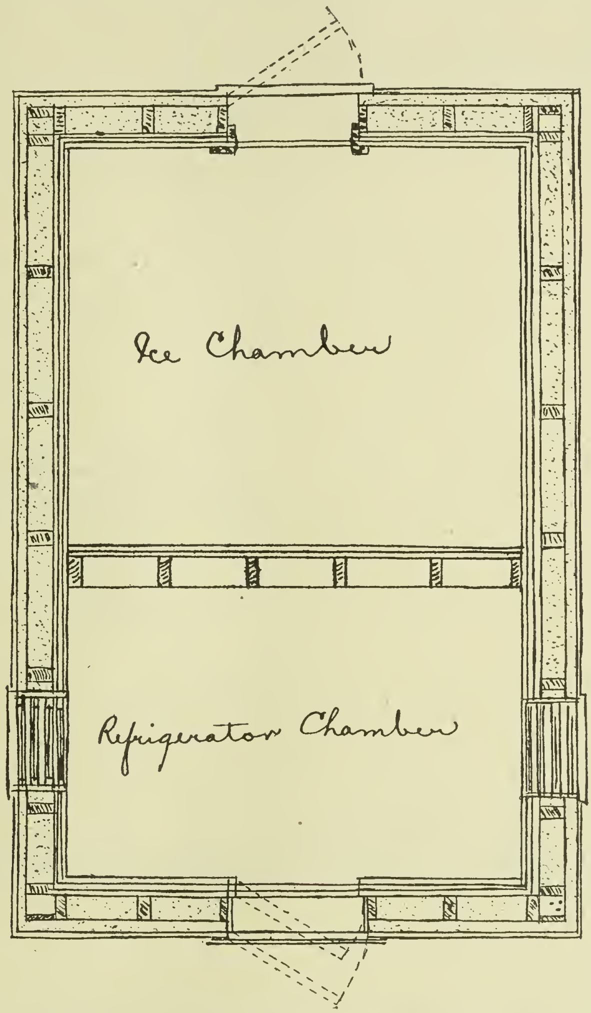


FIG. 2.—Horizontal plan of Hanrahan's cold storage, showing insulation.

Plan II., however, is imperfect in its results. By this plan, the air in the upper left hand corner is stagnant. To prevent such stagnation, a false ceiling is constructed, shown in III, by the aid of which an exit is provided for the warm air on both sides of the refrigerator, and the circulation becomes more complete.

The effect of this circulation is two-fold ; first, the moving air does not deposit its moisture in the refrigerator, but carries it up to the ice chamber where the moisture is condensed on the ice. Hence, the *air* of the refrigerator is *much drier* with circulation than without. Secondly, the spores that cause mould are carried along with the moist air, and deposited with the moisture on the ice, and carried off with the meltage So that with circulation the number of spores in the air of the refrigerator is much lessened ; and

in addition, those that remain are, on account of the dry air, less likely to develop and form mould.

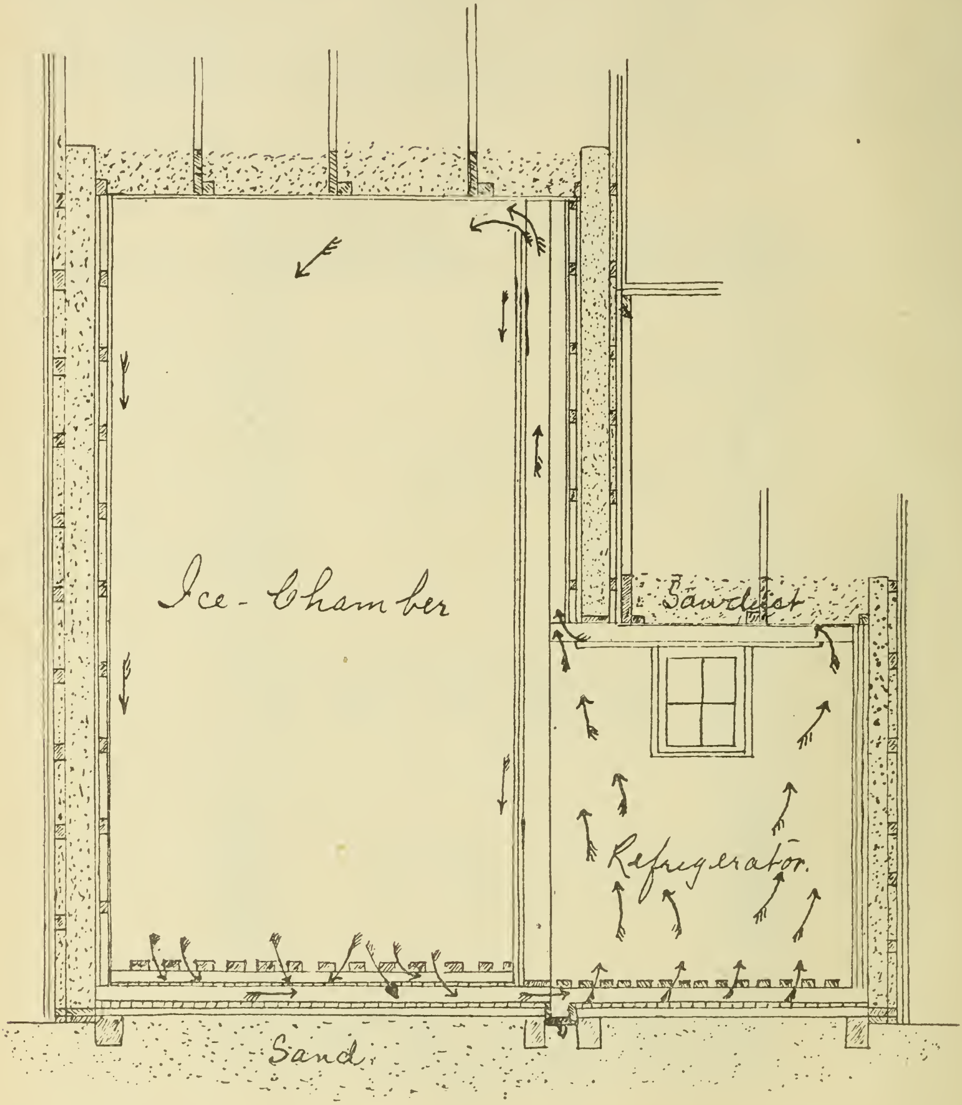


FIG. 3.—Vertical plan of Hanrahan's cold storage, showing insulation and air-circulation.

Hence, by a good system of air-circulation, two very undesirable conditions in a refrigerater are prevented or reduced to a minimum, viz., *dripping* and *mould*. It is probable also that some odorous gases given off by the products in the refrigerator are absorbed at the surface of the melting ice. So that a refrigerator provided with a good system of circulation is supplied with *cold* air *comparatively dry* and *pure*.

What Cold Storage cannot do. It is just as important to know what cold storage cannot do, as to know what it can do. Large quantities of valuable food-stuffs have been destroyed this year by placing them in cold storage with unfavorable surroundings. For instance, the refrigerator at the College was, by the order of the inventor of the system, sheeted inside with pine lumber, when spruce should have been provided, as odorless. The inventor claimed that by means of the excellent system of air-circulation all "moisture, odors, and gases" are removed from the storing-room.

But the odor of the pine was not so removed, and consequently the cheese and butter placed in storage at the beginning of the season was strongly flavored with pine. Again, later in the season, a large quantity of warm dressed poultry was stored in the refrigerator, and 24 hours afterward the room smelt like a poultry yard.

As a matter of fact, no system of cold storage, not even the best, can remove such odors and taints as these. In storing sensitive food-stuffs, such as eggs, butter, and cheese, the only safe course is to keep them entirely separate from strong-smelling stuff, such as onions, cabbage, or even tainted products of their own kind.

Further, cold storage is *not a curative* process. If goods, before being stored, are damaged or decayed, the best that can be done is to check or postpone decay.

A very important factor in the success of cold storage is the condition of the product stored. To make cold storage really worth while, the produce, whether meat, fruit, butter, or eggs, should be fresh, sound, and free from taint. Otherwise, the taint, the disease, or the bad flavor will generally develop and spread even at low temperatures, athough more slowly than at normal temperature.

Experiments in Cold Storage of Fruit.

Following the suggestion of some prominent fruit-growers, this department has undertaken a series of experiments in cold storage of fruit, principally apples and pears. The objects of the experiment are to discover the best temperatures for holding the various kinds of fruit ; also to discover the best methods of packing fruit for long storage.

For these purposes twenty boxes of Duchess pears have been packed by Mr. A. W. Peart, B.A., of Burlington, and two barrels and eight boxes of Snow apples by Mr. W. H. Dempsey, of Trenton. This fruit, both pears and apples, have been packed in duplicate, there being two boxes of each kind packed in the same way.

Hence, there are two lots of pears, ten boxes in each lot, one lot being held at a temperature of 33 degrees, and the other lot at a temperature of 40 degrees. This part of the experiment will demonstrate which is the better temperature for holding pears.

In each lot of ten boxes there are two grades of pears ; one being the Imperial or large grade for shipment to England, and the other the Selected, the grade next to the Imperial in size. The experiment thus will test the comparative suitability of these grades for long storage.

The preceding subdivision of the ten boxes gives five boxes in a group for comparison of modes of packing. These modes are as follows : pears only ; pears, with excelsior top and bottom ; pears, wrapped in tissue paper, with excelsior top and bottom and between the layers ; pears wrapped in oil paper, otherwise same as previous ; lastly, same as the third except that the box is lined inside with heavy paper making it practically air-tight. In the first four boxes there are openings between the boards for ventilation.

The apples are packed and stored according to a similar plan. It will be some time before any of the fruit will be reported upon. If definite conclusions can be reached from these initial experiments, a report of the same may be looked for in due time. It is intended to follow these experiments next year with a more extensive series.

Ventilation of Farm Stables.

Figures 4 and 5 show a plan of the ventilation that has been placed in our farm stables this year. Fresh air is brought into the stables from the roof by means of two pipes. These pipes are terminated at the peak of the roof by revolving cowls similar to those shown in Fig. 4 They are 30 inches in diameter, and furnish a combined inlet of about 10 square feet. They are connected below with wooden boxes that carry the air down through the barn to the ceiling of the stable, to the points marked I, Fig. 5. From these points, boxes extend along the ceiling to the floor, and along the floor of the mangers. In front of each stall in the passage a 4-inch opening is cut in the box, to let the fresh air into the passage.

The fresh cold air thus enters for the most part at the floor. The foul air passes out from the ceiling at the points marked 0, by means of pipes leading from the ceiling of the stable to the roof of the barn. It is intended to carry these outlet pipes through the roof and terminate them by a roof-like top, in order to protect them from wind and rain. As yet, however, this has not been done, the outlet pipes terminating at present just below the roof of the barn.

This plan of ventilation has not been in operation long enough to afford a complete test. It has so far been quite effective. The tinsmiths, however, in constructing the re-

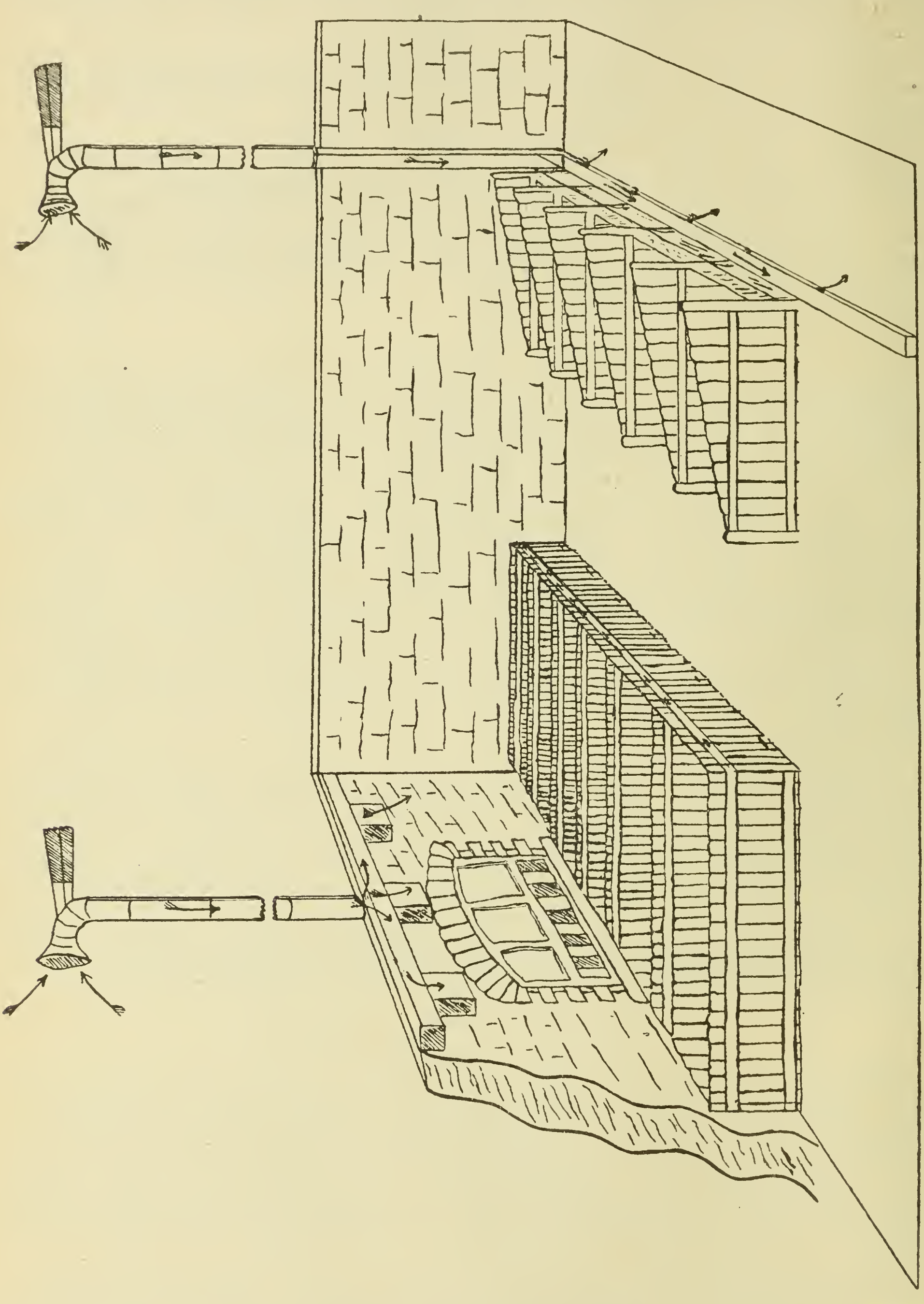


FIG. 4.—Showing fresh air brought in, in part at the floor, and in part at points between floor and ceiling. A system adapted to stables already built.

volving cowls, built them too light. The fan-tail that operates the cowl is attached to the cowl by rods, and these are not sufficiently heavy. I observe that one of the tails has been torn off by the wind, and consequently one end of the stable is without ventilation.

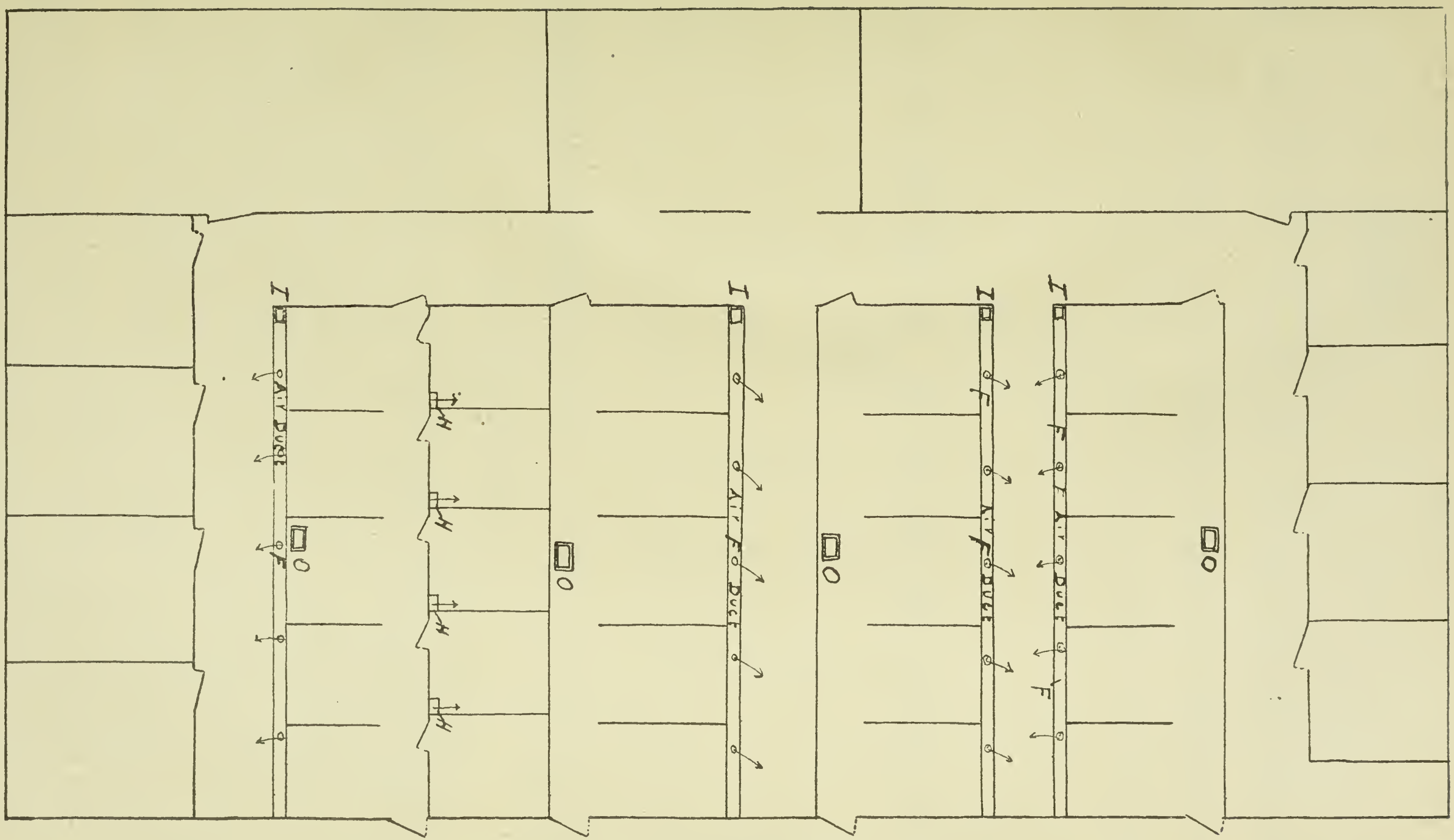


FIG. 4 —Showing Ventilation of Farm Stables. I, points where the air is brought to the stable from above ; F, inlets at the floor in front of sta'ls ; H, inlets to box stalls, half-way down from ceiling ; O, outlets at ceiling.

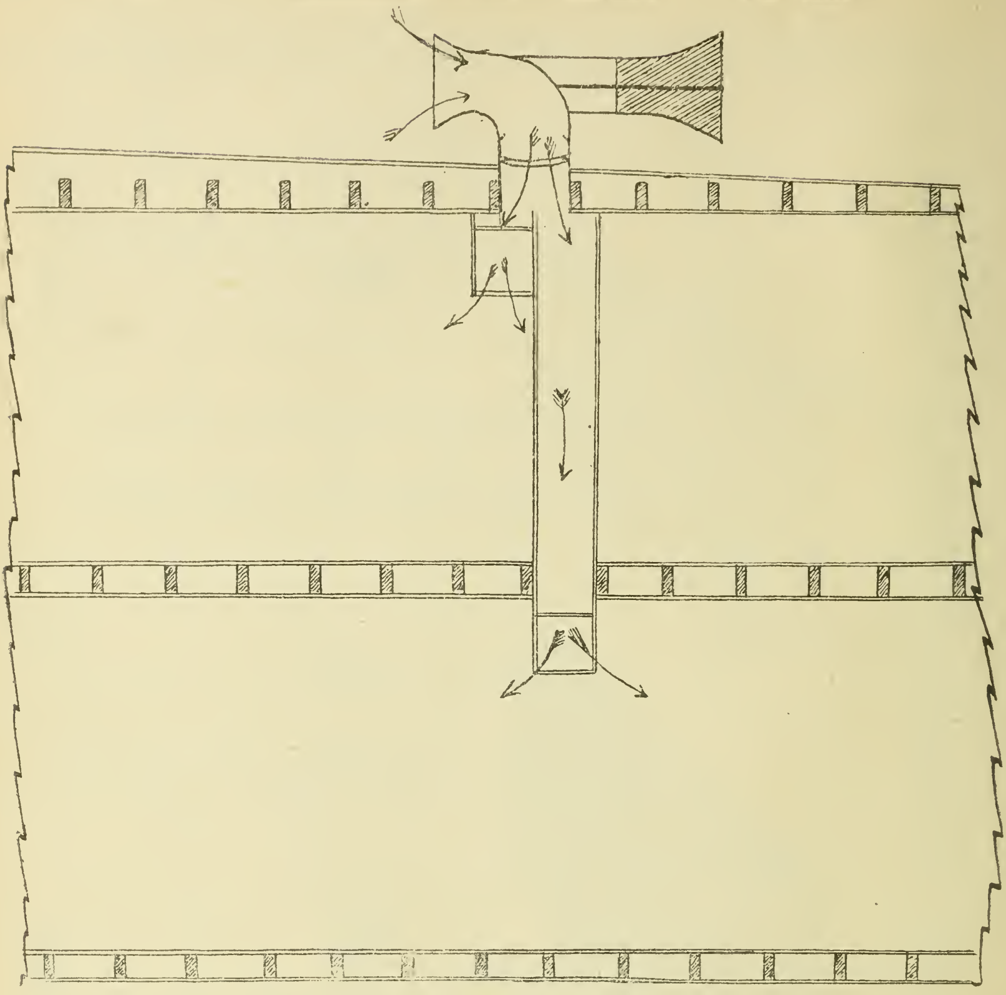


FIG. 6.—Section showing ventilation of part of College Residence.

When both cowls are working, it is very evident that fresh air is entering into the stable in considerable quantities The dangers to be guarded against are : a temperature too low, and a condensation of moisture in the outlet pipes and consequent dripping. Before the present system was introduced, there were ventilating pipes, ten of them, running from the ceiling of the stable to the roof of the barn, and connected with the louvred ventilators at the top. These pipes were intended to carry off the foul air. In winter, however, it was found that these pipes often conveyed dangerous down-draughts into the stable. When they acted as they were intended to do, and carried off the foul air, the moisture contained in the outgoing air condensed on the boxes at their upper end, and kept up a continual dripping. The result was that the lower ends of the pipes were kept stuffed with straw all winter, and they were practically of no use. In our present system, we have utilized five of the old pipes for inlets, and the remainder for outlets. As yet, there has been no sign of dripping, and it is expected that the brisk movement of air in the stable, an important factor in this system of ventilation, will carry the foul air out of the pipes before condensation can take place.

With regard to the chance of the temperature becoming too low, we have provided against this by placing shut-offs in the inlet pipes, at the ceiling. These shut-offs are operated by cords ; and, if there is danger at any time of the stable becoming too cold, a simple pull of the cord will shut off, partly or completely, the supply of fresh air.

A similar system has been introduced for ventilating the part of the College residence that has recently been fitted up. As shown in Fig. 6, the air from one cowl is carried to two flats by utilizing the spaces between studdings in the partition. The fresh air enters the corridor at the ceiling, and from the corridor finds its way into the rooms, on each side, through a permanent opening in the fan-light, provided expressly for this purpose. Each room is also equipped with a foul-air register in the side wall, near the floor, on the opposite side of the room from the fan-light. The foul air is carried up between studs in the wall to the garret and thence to the outside by means of ventilators in the roof.

Seventeen rooms on each flat, thirty-four rooms in all, are thus supplied with fresh air by three 15-inch cowls. It is impossible to give at present any experimental results as to the efficiency of the new system.

REPORT OF RAINFALL AND TEMPERATURES DEC. 1ST, 1900 TO DEC. 1ST., 1901.

Month.	Temperatures.				Precipitation.		
	Maximum.		Minimum.		Rain.	Snow.	Total in inches of rain.
	Degrees.	Date.	Degrees.	Date.			
December	49.0	3	— 4	14	.465	2. 4	.705
January	41.0	9 and 21	—14	19	.930	14.70	2. 40
February	31.0	26	— 7	24	....	9 75	.975
March	47.5	19	— 3	7	.450	9 25	1.375
April	77.0	30	27 0	1	1.710	5.25	2.235
May	75.0	6	32.0	15	3.255	....	3.255
June	92.4	28	35.0	9	1.525	. ....	1.525
July	94.2	2	50.2	9	4.065	....	4.065
August	88.2	15	46.5	2 and 9	3 510	....	3.510
September	86.2	7	33 5	19	2.445	....	2.445
October	69.2	2	23.5	25	3 367	....	3.367
November	63.0	1	11 0	28	1.885	3.75	2.260
For 1901	94.2	July 2	—14	Jan. 19	23.607	45.10	28.117
" 1900	96.0	Aug.6	—14	Feb. 26	20.011	61. 7	26.181

Number of days of sleighing :—January, 17 ; February, 28 ; March, 22. Total, 67 days, compared with 70 days in 1900.

Respectfully submitted,

J. B. REYNOLDS,

Professor of Physics.

PART III.

REPORT OF PROFESSOR OF BIOLOGY AND GEOLOGY.

To the President of the Ontario Agricultural College:

SIR,—I have the honor of presenting herewith my fourth annual report on the work of the Biological Department.

It is with a feeling akin to relief that I view the new Biological building now nearing completion, for with the great increase in the numbers of students in the last three or four years, our laboratory accommodation and equipment have become altogether inadequate. It is simply impossible for the students to do good work, or for the instructors in charge to direct the work satisfactorily. Notwithstanding the inconveniences under which we have labored, I have pleasure in stating that much valuable work has been accomplished. More attention than ever before has been given to individual laboratory instruction, so that every pupil has come into direct contact with the plants and insects which he has been studying. Certain investigations, entered upon last year, were continued and completed, while others were begun. Much information was given to the public in the form of bulletins, and articles published in the agricultural press, as well as by correspondence with persons who made direct inquiries by letter.

THE NEEDS OF THE BIOLOGICAL DEPARTMENT.

With the erection of the new laboratories, one of the most pressing needs of this department is disposed of. I beg, however, to call your attention to the other things which are absolutely necessary if the instruction in botany, entomology, zoology, and geology is to be of a practical character and of permanent value:

1. An Insectary, for the study of life-histories of insects.
2. New microscopes for the use of the third and fourth year classes.
3. Apparatus for practical work in plant physiology and the culture of fungi.
4. More assistance, so that investigation work may be carried on in the study of injurious insects and plant diseases. With the introduction of the Nature Study course in April, May, and June, no time will be left the regular officers of this department to conduct systematic investigations along these lines.

CLASS-ROOM AND LABORATORY INSTRUCTION.

A re-arrangement of the courses became necessary at midsummer, owing to the promotion of Mr. M. W. Doherty to an associate professorship, and the appointment of Mr. T. Jarvis, B.S.A., as helper. In this new arrangement of the courses I retained all the physiological botany, fungi and plant pathology, entomology and geology, while to Assoc.-Prof. Doherty was assigned the systematic histological and structural botany of all the years, and the zoology of the first and fourth years.

Under this new arrangement the work has thus far gone on smoothly; besides, I am relieved very much from the taxing burden of lecturing as frequently as formerly to large classes, as a portion of this burden is now borne by Assoc.-Prof. Doherty.

Following is a brief synopsis of the courses given in 1901 in botany, entomology, zoology and geology:

BOTANY, FIRST YEAR. (a) Field excursions, where the student familiarizes himself with the names of the common wild plants, learns their manner of growth, and the way the fruits and seeds are produced and disseminated; (b) laboratory studies of the entire plant, including root, stem, leaves, and fruit; and (c) lectures summarizing and illustrating the practical work, by Assoc.-Prof. Doherty.

BOTANY, SECOND YEAR. (a) Laboratory study on the morphology of plants, and their classification; a critical study of weed seeds, and an elementary course in the study of grasses and fungi; (b) lectures (two every week) on the morphology, classification, and physiology of plants, by Prof. Lochhead and Assoc.-Prof. Doherty.

BOTANY, THIRD YEAR. (a) Laboratory and lecture courses in systematic botany, including grasses, by Assoc.-Prof. Doherty ; (b) Laboratory and lecture courses in fungi and plant pathology, by Prof. Lochhead ; (c) Lecture course in plant physiology by Prof. Lochhead.

BOTANY, THIRD YEAR, SPECIALISTS IN HORTICULTURE. A laboratory and lecture course in plant histology, by Assoc Prof. Doherty.

BOTANY, FOURTH YEAR. (a) Laboratory and lectures courses in systematic botany, by Assoc.-Prof Doherty ; (b) laboratory and lecture course in fungi and plant pathology, by Prof. Lochhead.

ENTOMOLOGY, FIRST YEAR. A short course of four lectures on insect life was given to the first year students, the object being to show the great economic importance of the subject. These lectures also embraced something on methods of collecting and preservation, and on the life histories of a few common insects, such as the housefly, mosquito, squash-bug. and cabbage-butterfly, by Prof. Lochhead.

ENTOMOLOGY, SECOND YEAR. This course of thirty-five lectures and demonstrations is made as practical as possible with the laboratory accommodation at our disposal. The chief insect pests of the farm, orchard, and garden are discussed and studied, by Prof. Lochhead.

ENTOMOLOGY, THIRD AND FOURTH YEARS. This course, consisting of lectures and practicals, deals with both beneficial and injurious insects, and is a continuation of the second year course. Here, the students become acquainted with the literature of the subject ; by Prof. Lochhead.

ZOOLOGY, FIRST YEAR. So far, this course, owing to lack of room, consists entirely of lectures and demonstrations, thirty in all. The chief animal types from the Amoeba to the Mammals are discussed at some length.—Professors Lochhead and Assoc.-Prof. Doherty.

GEOLOGY, FIRST YEAR. A course of thirty lectures and demonstrations dealing with the common minerals and rocks, the chief agencies operating in the formation of soils, and the geological history of the rock formations of Ontario, by Professor Lochhead and Assoc.-Prof Doherty.

GEOLOGY, THIRD YEAR. This course is a continuation of the first year course, but it is of a more practical nature, because the class is smaller. Considerable attention is given to the formation of soils through glacial action ; and the geological history of North America is studied, with special emphasis on the Canadian region, by Prof. Lochhead.

Heretofore, through lack of accommodation and help, no laboratory instruction has been given first year students in zoology and geology; but it is our purpose to make a beginning of laboratory work in these subjects this coming year, for lectures without practical work are of little value.

OUTSIDE WORK.

During the year, many calls were made upon this department for assistance and advice with regard to injuries caused by insects, fungi, and weeds. In May, two weeks were spent in the south-west counties in a study of the habits of the Hessian Fly, the object being to find out the best methods of dealing with this destructive insect. A visit was made to Galt in June to confer with the civic authorities there as to the best means to adopt in preventing the ravages of the American Tent Caterpillar ; and an outbreak of Rose-chafers in two peach orchards near Niagara-on-the-Lake necessitated a trip to that district.

As Inspector of Fumigation Appliances, I visited many of the nurseries east of Toronto, and in the Niagara district.

In April, I delivered an illustrated lecture on " The Care of Shade Trees," before a joint meeting of the Hamilton Horticultural Society and the City Improvement Society in the Y. M C. A. Building, Hamilton.

Believing that the introduction of Nature Study into our Public Schools would not only be of great educational value, but also be a means of stimulating the young people of our rural districts to take an increased interest in farm life, I gave several addresses before Teachers' Associations on the aims of Nature Study, and the best methods of teaching this very important subject.

The introduction of Nature Study into the Third Year course of this College will, in my opinion, have far-reaching results. Every graduate will not only exert a strong, active influence in favor of the study of Nature, but will also, in virtue of his knowledge of the subject, gained at the College, be able to bring the matter forcibly before the public in his addresses at Farmers' Institutes and other meetings. In fact, a new and powerful impetus will be given to one of the greatest educational movements of the day,—a movement which has for its chief aim: "To cultivate the child's power of observation, and to put him in sympathy with out-door life."

Bulletins, Reports, and Articles Published during the Year.

During the summer, I prepared a bulletin on "The Hessian Fly in Ontario," which embodied the results of my studies made earlier in the year. This bulletin was published by the Department of Agriculture, Toronto, and distributed before fall wheat seeding-time to the farmers of the infested areas.

A newspaper bulletin on "Grain Rusts" was published in August, on account of a wide-spread desire for information regarding this fungus, which was prevalent and injurious in many sections of the Province. I have thought it advisable to incorporate the bulletin in this report, as it contains in a concise and popular form the latest results and conclusions of the most recent investigations.

In February, I presented my second annual report as Inspector of Fumigation. This report was printed as part of the Report of the Minister of Agriculture for Ontario.

In early spring, I prepared a circular on the "Treatment of Smuts," which gives concisely the best methods of treating oats and wheat for the prevention of smut. The contents of the circular were published in some of the agricultural papers of the Province.

At the annual meeting of the Entomological Society of Ontario held in London, November 13th and 14th, I read the following papers: (1) "The Injurious Insects of the season of 1901," (2) "The Hibernation of Insects," and (3) "Nature Study Lessons on Mosquitoes." These papers will appear in the forthcoming annual report of the Entomological Society.

The following articles on Injurious Insects, Weeds, and Fungi were contributed to the Press:

Crude Petroleum Experiments Against the San José Scale (*Canadian Horticulturist*).
Recent Books on Mushrooms and Toadstools (*Canadian Horticulturist*)
Peach Yellows (*Canadian Horticulturist*)
Protection of Shade Trees in Towns and Cities (*Canadian Horticulturist*).
The Original Home of the San José Scale (*Canadian Horticulturist*).
Spraying (*Canadian Horticulturist*).
The Buffalo Tree-Hopper (*Canadian Horticulturist*).
More About the San José Scale (*Canadian Horticulturist*).
Some Raspberry Pests (*Canadian Horticulturist*).
An Abnormal Growth on the Scotch Pine (*Canadian Horticulturist*).
The Quarantine of American Fruits in Germany (*Canadian Horticulturist*).
Treatment of Corn Smut (*Farmer's Advocate*).
The New Peach Pest (*Sun and Globe*).
The Hessian Fly Again (*Farmer's Advocate*).
Black Rot of Grapes in Essex (*Farmer's Advocate*).
Some Useful Friends (*Guelph Mercury*).
Ants, Buffalo Carpet Beetles, and Clothes Moths (*Guelph Mercury*).
The Plum Curculio (*Guelph Mercury*)
The Flying Boring Bug (*Farmer's Advocate*).
Round-Leaved Mallow (*Farmer's Advocate*).

Injurious Insects and Fungous Diseases.

The season of 1901 was decidedly favorable for the development of plant diseases induced by fungi. The number of injurious insects was as large as that of 1900, and much injury was wrought by the Hessian Fly, apple-tree Borers, Plant Lice, San José Scale, Oyster-Shell Bark-Lice, Scurfy Bark-Lice, and other common insects.

In the matter of spraying, much ignorance still exists regarding the proper materials, and the right proportions of the materials to use against the different insects and fungi. All this kind of information is given in a special bulletin published by the Department of Agriculture, entitled "Insects and Plant Diseases;" but I shall take the liberty of re-stating some of the common formulae for both large and small quantities :

Paris Green Mixture—for leaf-eating insects :

Paris Green	1 lb.	or	1 teaspoonful (level).
Water	200 gals.		1 pail (2 gals.).
Lime (fresh)	1 lb.		1 teaspoonful (level).

Hellebore :

White Hellebore ....1 oz.
Water ....2 gals.

Insect Powder :

Pyrethrum ....1 oz.
Water ....3 gals., to be sprayed on the leaves.

Pyrethrum ....1 part.
Flour ....4 parts, to be dusted on plants.

Whale-oil Soap, for plant-lice and bark-lice :

Whale-oil Soap ....1 lb.
Water ....7 gallons.

Kerosene Emulsion, for bark-lice and plant-lice :

Coal oil ....2 gallons.
Soft water ....1 gallon.
Soap ....1·2 lb.

Dissolve the soap in the boiling water, then add the coal oil, and churn briskly for 5 minutes. Before using, dilute with 9 parts water.

Combined Paris Green and Bordeaux Mixture, for fungi and biting insects :

Blue Vitriol	4 lbs.	or	4 tablespoonfuls (level).
Quick Lime	4 lbs.		4 tablespoonfuls (level).
Paris Green	4 oz.		1 tablespoonful (level).
Water	40 gall.		1 pail (2 galls).

In a paper read at the annual meeting of the Entomological Society of Ontario in November, I gave a brief account of the Injurious Insects of the Year, which came under my notice. Some of the insects there discussed are : *The Potato-Stalk Borer* (Trichobaris trinotata), which injured the potato crop of Pelee Island ; the *Rose-Chafer* (Macrodactylus subspinosus), which damaged the peaches in two orchards near Niagara-on-the-Lake ; the *Asparagus Bettles* (Orioceris asparagi and C. 12 punctata), which appeared for the first time on the asparagus plants at the College ; the *Cherry Aphis*, (Myzus cerasi), which did considerable injury to the cherry trees in the Niagara peninsula ; and *Bush Fruit Insects*.

I also called attention in that paper to the utter worthlessnesss of the Haseltine Trap Lantern as a Codling Moth catcher. In my experiments, carried on during the summer, not a single Codling Moth was caught ; while 74 per cent. of all the insects taken by the traps were beneficial. I am sure that as soon as the orchardmen of the Province are made aware of the imposition, they will not allow another lantern of the kind to be burned in their orchards.

The Tussock Moth (Orgyia leucostigma), (Fig. 1). Some three or four years ago, the Tussock Moth was considered a serious enemy of shade trees in Toronto, but of late little attention has been paid to it. The citizens are told occasionally by those in charge of the parks that the city is practically free from the pest. As a matter of fact, however, there was little difficulty in finding the egg masses in late fall on any of the streets bordered with shade trees. Experience would tell us that the Tussock Moth has sufficiently recovered from the treatment it received a few years ago to undertake aggressive action the coming season ; and the abundance of the egg-masses on the lower limbs of the trees would indicate that the aggressive activity of the pest would amount to a real danger.

This danger may be averted from Toronto, and, perhaps, the surrounding towns, by timely action on the part of the park authorities and the citizens.

It is well known that the pest passes the winter in the egg stage. The eggs are in masses, which are usually found on the lower limbs, but sometimes on rubbish and fences near the tree. By carefully collecting and burning all the egg-masses that can be found in the winter, few caterpillars will make their appearance in spring. The more carefully the collecting is done, the fewer caterpillars will appear.

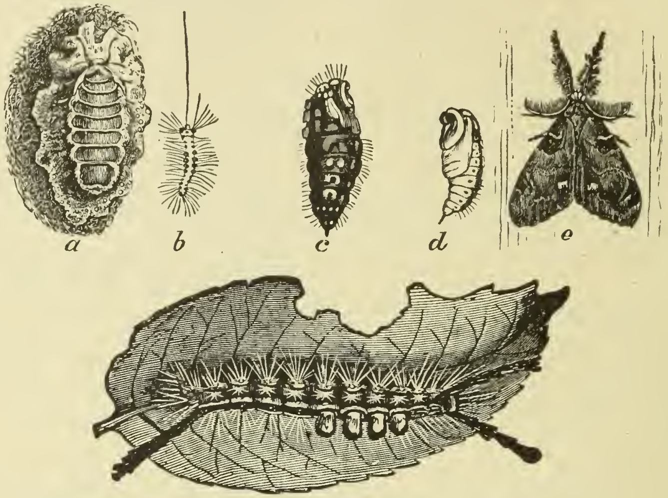


FIG. 1.—Tussock moth. *a*, wingless female on mass of eggs ; *b*, caterpillar ; *c*, female pupa ; *d*, male pupa ; *e*, male moth ; *f*, full grown caterpillar.

Again, the banding of unattacked trees will prevent the caterpillars from ascending them, while it will also prevent the wingless female moth from climbing the tree and depositing her eggs on the limbs. "A broad, thick, strip of cotton, tied about the trunk of the tree with a string" is as good a band as can be applied. Bands or rings of some coal-tar product are also effective.

GRAIN RUSTS. The damage done by rusts every year to the grain crops of Ontario may be safely estimated by hundreds of thousands of dollars. The amount of damage varies with individual years, according to variations in atmospheric and soil conditions. During damp, warm seasons the damage is usually so severe that, in some localities, but a fraction of the possible yield of grain is obtained, a yield which scarcely pays for the trouble of harvesting and threshing.

What are rusts? Rusts are parasitic plants, that is plants which obtain their nourishment from living matter by sending tiny branches into the tissues. They belong to a low class of plants called Fungi, which are characterized by the absence of green coloring material, by the production of spores instead of seeds, and by the very simple structure of their tissues. The rusts, moreover, are very remarkable fungi, from their peculiar habit of changing their habitation from wheat, barley or oats to other plants. Not only do they change their habitation, but they change their form and structure as well, so that it would be impossible, unless one knew, to recognize the wheat rust after it has changed its abode to one of the other plants upon which it develops.

Two stages of wheat and oat rust are probably well known; one, the red rust, develops in early summer, and the other, the black rust, in the late summer and autumn. The characteristic colours of the two stages are given by masses of spores growing in layers upon the plant body of the rust. This plant body consists of a net work of threads living in the tissues of the wheat stem and feeding on the living liquid material. (Fig. 2, A. B.) The spores project from the inside of the wheat stem by the rupture of the skin or bark, and are separated from their stalks by the wind, which may continue to carry them all summer to other wheat and oat fields. Thus the infection spreads by means of the red-rust spores throughout the summer. From the same plant body which pro

duces the red spores, appear the black spores later in the season in equally large numbers These, however, must remain dormant all through the winter on the stubble of the field before they will germinate, so that the black spores are not instrumental in the infection of new fields the season they are produced (Fig 2,C). The red spores are minute, infect the wheat, oval, spiny, one celled bodies, (Fig. 2, D.) but, the black spores have thicker walls, and are two- celled.

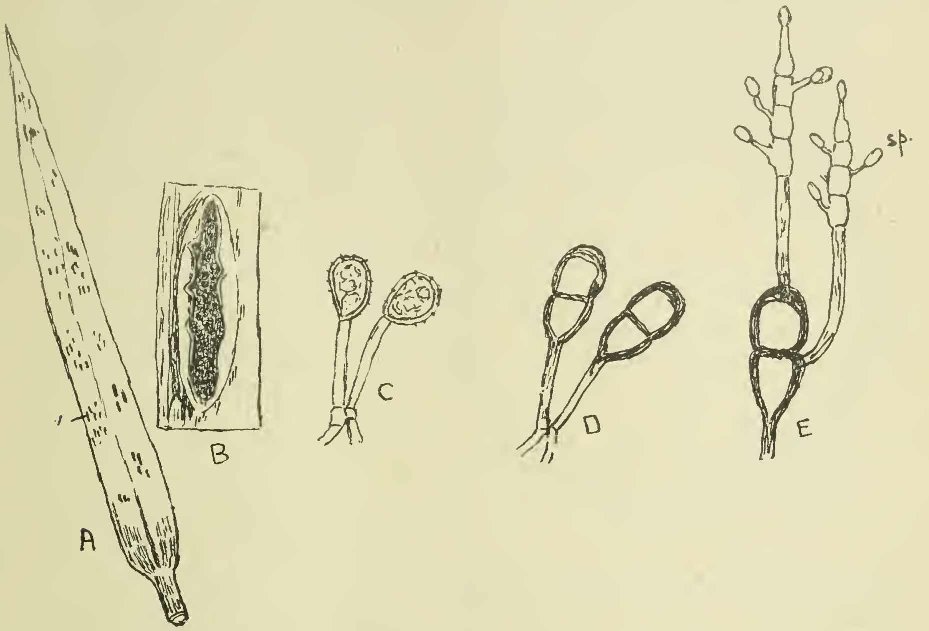


FIG. 2.—*Puccinia graminis.* *a*, leaf of wheat affected with rust spots (1); *b*, a rust spot which has ruptured the epidermis of the leaf, as seen by a good magnifying glass; *c*, two red-rust spores attached to the leaf by their stalks, highly magnified; *d*, two black-rust spores attached to the leaf by their stalks, highly magnified; *e*, a black-rust spore germinating in the spring and giving rise to sporidia (sp.). These may infect the leaves of barberry. (Original).

In the spring the black-rust spores develop a tiny thread and produce new spores called Sporidia, which do not affect the wheat plant, but readily affect the leaves of the

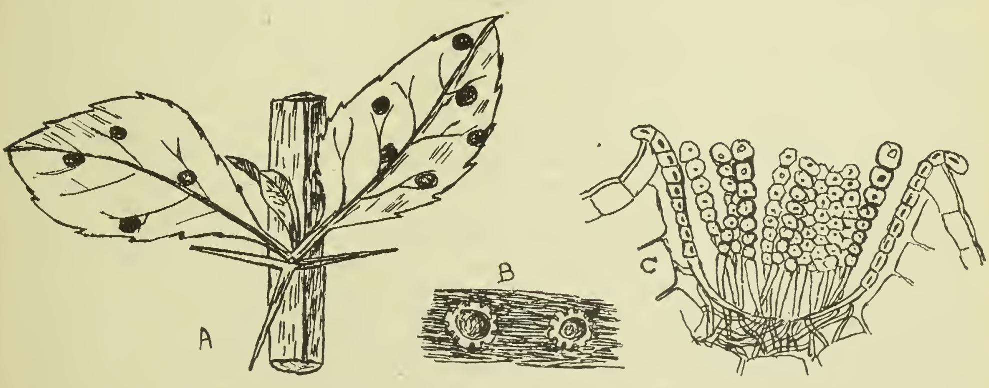


FIG. 3.—*a*, barberry leaves containing clusters of Æcidia or cluster-cups (1); *b*, two cups of a cluster, as seen by a good lens; *c*, section of a cluster-cup, showing how the chains of spores are borne within the cup. These spores on being set free may infect the wheat plants, highly magnified. (Original).

barberry. Two sorts of spores are (Fig. 3, E) formed on the barberry leaf by this infection. One kind is readily seen on the upper side, and the other on the lower surface in yellow,

minute cups called cluster-cups. It is known that the orange-colored spores, when set free from the cluster-cups and blown away to a wheat field will infect the wheat and give rise to a parasitic fungus-plant-body within the wheat stem or leaf, from which red-rust spores are produced.

We thus observe that during its life-cycle the wheat rust fungus bears at least four different kinds of spores, viz., red-rust on wheat in summer, black-rust on wheat in late summer, sporidia (Fig. 4) in spring, and cluster-cup spores on leaves of barberry in the spring.

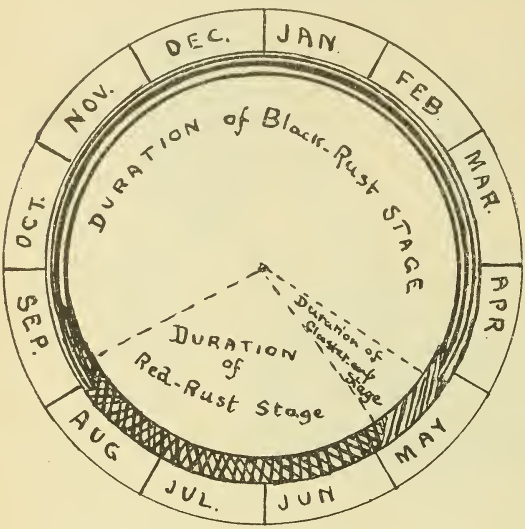


FIG. 4.—Diagram to show the normal life-history of wheat rust (*Puccinia graminis*). - (Original).

That the full history of the wheat rust fungus was not fully known until recent years is not to be wondered at when we consider its wonderful migratory habit, and the extraordinary changes in form which it assumes upon the different plants. It was thought the cluster-cups were entirely different from the rust, but when people noticed more than a century ago that "barberry bushes blasted the wheat" a hint was given to modern research work, in consequence of which the relations and astonishing behaviour of the rusts are better understood. It is now known that with some of the rusts (for there are several hundred varieties) one or more of the three stages is absent or has become extinct; so there are varieties which exist only in the black-rust stage, some in both the red and black-rust stages, and others in all the stages. Whether wheat rust ever omits one of its stages in Ontario is not certainly known, but evidence is accumulating to show that the rust may be prevalent in localities where the barberry is unknown, so that the latter is not absolutely necessary for the continued propagation of the fungus. For example, the cluster-cup stage is not met with in Australia, in Central India, or in the Western States, yet the rust is only too prevalent in those very regions. Nearer home, in the Streetsville district of Ontario, no barberry has been reported, yet the rust is very severe this year, many fields being so badly attacked as hardly to pay for the threshing.*

In districts where the barberry is common the fungus, to all appearances, uses that shrub as a second host, and the full life cycle is then completed as already described. The cluster-cup spores infect some of the wheat plants close by and give rise to the plant body within, from which red-rust spores are liberated during the early summer, and the black-rust spores later in the season. In the vicinity of Barrie the fields of wheat are very badly rusted this year. Moreover, this destruction of wheat by rust is an annual occurrence there, and so disheartened have the farmers become that they approached the Legislature for help last year. The evidence given before a committee of the House was so strong against the barberry that an Act regarding its destruction was placed on the statute books of the Province. There are miles of barberry hedges, however, within the limits of the town of Barrie, over which the outlying municipalities have no jurisdiction, so that as far as the farmers, whose wheat fields are affected, are concerned, the Act is of no use whatever. The infestation is manifestly the result of the spread of the cluster-cup spores from the barberry hedges of Barrie. In all cases the wheat close to the hedges is shockingly bad, and the further removed the field is from the hedge the less marked is the rusting. The infected wheat has grains so shrunken that they would scarcely weigh 20 pounds to the bushel. Two or three interesting cases

* Since writing the above I have been informed on good authority that barberry really exists about Streetsville in quantities capable of infecting large areas of wheat. Mr. J. D. had a hedge twenty rods long, untrimmed, and about fifteen feet high, but after reading my Bulletin in August, had it all destroyed. Other plantations have also been reported, and it is quite probable that the barberry is well distributed in the Streetsville section. W. L.

were noted in the same township of the influence of barberry hedges on wheat fields. A few years ago one or two farmers planted some hedges of this shrub, but to their dismay their wheat fields became badly infested, although prior to the planting, no rust had been observed. After the removal of the offending hedges rust did not again make its appearance.

Mr. C. A. Zavitz, Experimentalist at the Ontario Agricultural College, had a like story to tell. So long as a fine barberry hedge flourished along one side of a certain field on College Farm, the crops were badly rusted, but so soon as the hedge was removed the rust failed to appear. Lately, however, the college fields are badly rusted.

It would certainly appear from these and many other cases which might be given, that if the barberry is not absolutely necessary for the continuous propagation of wheat rust in Ontario it is at least a very important factor.

But how are we to explain the development of rust in regions where there is, undoubtedly, no barberry, or where, according to some authorities, the barberry stage is not a necessary stage in the life-cycle ? Several theories have been proposed.

One theory is that the red rust spores may winter over and infest the wheat directly next season. It has been demonstrated clearly that the red rust spores winter over in Australia, but in no other country has this observation been made.

Another theory which has many strong advocates in America is the probability that a portion of the plant-body, or the tangle of threads living within the tissues of the wheat plant, may winter over and give rise to red rust spores directly the following season. This view, if fully established, would account for much of the extensive early appearance of the rust which is otherwise difficult to explain.

Some investigators have supposed that the black-rust spores, or perhaps their sporidia, may infect the wheat plant directly without the aid of the barberry. All experiments, with one exception, made to test the matter, have failed to get positive results.

Eriksson, the great Swedish investigator of rusts, is of the opinion that "the fungus is transmitted from the rusted parent to the grain as a plasm, which lives a latent life in the cells of the embryo and young plant until just before the eruption of rust spots, at which time it develops an ordinary plant body or mycelium." Athough an ingenious theory, it is not held as a very probable one by a great many very competent authorities.

Eriksson's investigations, however, on ordinary rust, have been very valuable, as he has shown quite conclusively that the red rust spores which produce rust on wheat cannot reproduce the disease on barley or oats, nor can the red rust spores on oats reproduce the disease on wheat or barley, nor the red rust spores on barley reproduce the disease on wheat or oats, although all these varieties of rust belong to one species, Puccinia graminis, and cannot be told apart even by the microscope. Thus there are three distinct "biological varieties" of Puccinia graminis :

Var. 1. P. graminis tritici, on wheat only.

Var. 2. P. graminis secalis, on rye, barley, and couch grass.

Var. 3. P. graminis avenae, on oats, meadow foxtail, and cocksfoot.

The conditions favorable to the spread of rust are moisture and heat. A rainy season, when the intervals are characterized by intense heat, is an ideal one for the spread of rust. Thus, seasons characterized by frequent thunderstorms and accompanying strong winds will have more than the usual amount of rusted grain.

The red-rust spores are distributed by the winds, and the rapidity of the spread is marvellously rapid to the unscientific mind, who looks upon the rust as he would upon the hot blast of a fire scorching the leaves from a distance. As a matter of fact when the red-rust spores are wafted by the winds to unaffected leaves, a period of incubation occurs, from seven to ten days or more, before the rust spots appear on the leaves and stems.

It may be stated here that atmospheric conditions, such as abundant moisture, either as rain or dew, and hot spells, are not the cause of rust, but simply conditions under which rusts will propagate themselves most rapidly. It is not likely that the smoke of locomotives has any influence whatever in the spread of rust, as some farmers claim it has. It is also very essential that plants suitable to the fungus be present, if the disease is to spread rapidly, for every fungus has its own peculiar plant upon which it feeds.

At present no satisfactory method is known for the prevention of the loss by rust. Spraying the crop although theoretically good, is practically impossible, while pickling the seed grain is useless. No practicable method of "policing the atmosphere" and preventing rust spores from finding their way to the young wheat has been devised. Austra-

lia is working along the line of development of rust-resistant varieties, and has secured results of great practical value. "That country now has wheat varieties that are vigorous, true to name, and of exceptional quality for the particular region in which they are grown". While some attention has been given to this important question in America, little has been done in Canada It is believed, however, that varieties of wheat with narrow, erect leaves, and a stiff skin upon which there is a marked, waxy "bloom" are as a rule less easily infected with rust than those with broad, soft, green leaves In England, Nursery, Trump, and Squarehead are highly recommended. In New York and Canada the bearded varieties appear to suffer least. Turkey Red makes a good showing, while the Glyndon of Dakota showed practically no traces of rust.

There appears to be no appreciable difference in resistance of the following varieties sown in Ontario : Manchester, Early Red Clawson, Genesee Giant, Dawson's Golden Chaff, and Democrat, as all were equally affected.

A word here as to rust-resistant varieties. It is probable that the rust-resistant varieties of one district will not be completely rust-resistant in another district, where the soil is richer and moister, and the atmosphere is more humid Local differences are apparent in nearly every section For example, the wheat was more rusted in low lands and valleys about Streetsville than it was on the hillsides and uplands. The reason for this difference in resistance to rust is probably the ranker, more succulent growth of crops in the lowlands, and the greater amount of moisture including dew. It is apparent from the study of plants that if rust-resistant varieties are to be produced in a Province like Ontario, where marked variations in soil and surface conditions exist, the varieties will have to be developed locally.

Along the line of prevention of rust, it has been urged that an excessive use of nitrogenous manures, such as dung or nitrate of soda, should be avoided, as it tends to a growth of strong, soft stems to which rust spores can easily effect an entrance. Again good drainage is decidely beneficial, for the dampness of the soil and the excessive moisture of air will be removed, and the conditions made less favorable for the development of the fungus, as has been described.

If Eriksson's plasm theory be the correct one, it is important that seed grain be procured from localities which do not have the rust, while the destruction of barberry shrubs would be of undoubted value in lessening the intensity of the disease, as I have already shown.

Finally, the destruction of weeds which may harbor some of the stages of the fungus is important. It is impossible to name these plants here, for their names are not even mentioned by investigators.

The Black Rot of Grapes. (*Laestadia bidwellii.*)—This fungous disease is very destructive this year in vineyards which have been neglected, and left unsprayed from year to year. Many grape-growers have been forced to give up the cultivation of grapes, because they have persistently neglected to spray with Bordeaux mixture, and to adopt such measures of cleanliness in autumn as are embraced under the term "clean farming." Numerous inquiries were made this autumn regarding the extent of the damage. The replies indicate that the disease is common in the grape districts, especially those of Essex county. The heavy rainfall during July and August is largely responsible for the virulence of the disease this present season, for experiments show that a moist atmosphere is a most suitable condition for the spread and germination of the spores.

Black Rot is not a new disease. In fact, it is indigenous to America, and it is to be found on the wild forms of grape. Ever since 1885, however, when it was discovered in France, much attention has been paid to it, and now it is considered one of the most destructive enemies of the grape throughout the United States and Canada.

The disease usually makes its appearance first on the leaves, as small brownish blotches, somewhat resembling those of sunscald. A few weeks later, brownish spots appear on the berries, and in a few days the entire berry becomes diseased. A soft rot ensues, followed by a collapse and drying of the tissues. Gradually the berries become shrunken, shrivelled, black, and hard. The surface becomes prominently marked with strong, irregular ridges (Fig. 5).

With the aid of a pocket-lens, the surface will be seen to be covered with minute, black pustules, which contain the summer spores of the fungus (Fig. 6) The spores ooze out to the surface, and are scattered by the rain and wind to unaffected grapes and leaves which begin to show signs of disease within ten or twelve days.

The disease may also spread rapidly from a diseased berry of the cluster to others which are in immediate contact with it, or it may extend from one berry to another by the spread of the fungal threads through the stalks of the cluster.

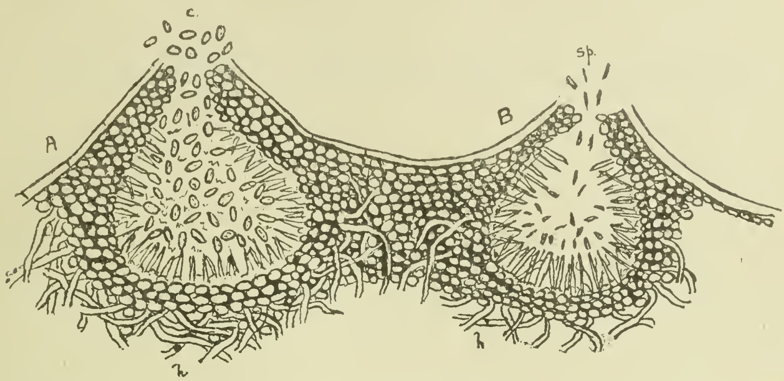


Fig. 6.—Magnified view of sections of two pustules of Black-rot. *a*, a cavity or pycnidium containing the conidia or summer spores, which are borne on the tips of short stalks, or conidiophores ; *b*, a cavity or spermagonium containing spermatia spores, borne also on slender stalks, (h) hyphal threads of the fungus within the disorganized tissues.—(Original).

Other spores, the ascospores, are produced during the winter on the shrivelled grapes and leaves left on the vine or on the ground. The ascospores are borne in sepecial sacs, called asci (Fig. 7), and are set free in spring. They are then capable of starting the disease afresh on the leaves.

It is also possible that the fungus may winter over in the fruit and leaves, as close, compact masses of fungus threads, known as sclerotia. From these, in spring, spores are set free, which may infect the new leaves.

With a knowledge of the life-history of the fungus, it is clear that the main remedy is one of prevention. The following preventive remedies will be found effective : 1. Destroy all leaves and dead grapes in the autumn, so as to kill all wintering spores. 2. Spray the vines with Bordeaux mixture just as the leaf buds are beginning to expand, and again at intervals of

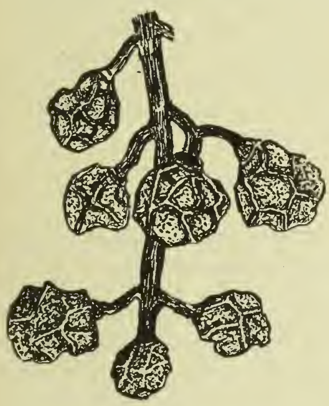


Fig. 5.—A cluster of grapes rendered worthless by the black-rot.—(Original).

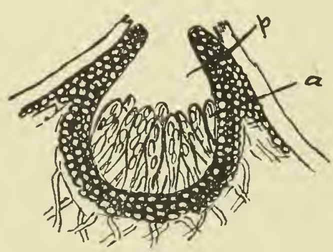


Fig. 7.—The winter form of spore, the Ascospore, produced in club shaped sacs (a) within a special cavity, a perithecium (p).

ten days or two weeks, until the berries are half grown. If rain occurs frequently to wash off the mixture, frequent applications should be made,—for spores will germinate, unless the vines are covered with the Bordeaux.

In conclusion, I beg to acknowledge the efficient assistance of Mr. Tennyson Jarvis, B.S.A. in the work of this department. He has faithfully performed the work assigned him during the year, and has aided me greatly with my laboratory classes and in the collection of insects and fungi.

Respectfully submitted,

W. LOCHHEAD,

Professor of Biology and Geology.

PART IV.

REPORT OF THE ASSOCIATE PROFESSOR OF BIOLOGY.

To the President of the Ontario Agricultural College:

SIR,—I have the honor to submit herewith my first annual report as Associate Professor of Biology.

Owing to the fact that my appointment was made late during the year, very little time remained for the arranging and carrying out of experimental work The work herein reported upon, however, will be found to be of considerable interest, and it is hoped in the course of a few years to have much valuable information regarding weed eradication and weed seed dissemination to place at the disposal of the farmers of the Province as well as considerable exact data regarding the nature of the food consumed by our birds.

CLASS ROOM.

As a result of the fact that Botany and Zoology form a part of the work in each of the four years much of my time is occupied in lecturing and demonstrating. In all of the courses now in my charge I have endeavored to make the work as practical as possible, and I am of the opinion that the results have been such as will justify increased attention being paid to the work of the laboratory. It is hoped that the facilities which we will enjoy in our new quarters in the Physical and Biological Building, will permit of many desirable changes along this line. Zoology, which has heretofore been purely a lecture course in the first year, will hereafter be made a lecture and laboratory course. Increased attention will be made to systematic botany and a study of weed problems.

It is our desire that the work pursued in this department by the students, while being technically exact, should also be of such a nature as to increase their powers of observation and cultivate their faculties for drawing correct conclusions.

REPORT ON MUSTARD SPRAYING.

Having received, through President Mills, instructions from the Minister of Agriculture to make a short tour for the purpose of giving practical demonstrations of the effectiveness of the method of destroying Wild Mustard by spraying with a solution of copper sulphate or "bluestone," I arranged dates extending over a period of about three weeks From the fact that the time during which this operation can best be carried out extends only from the time the mustard is about six inches high until it is just coming into bloom, it became necessary to limit the field of operation to one portion of the Province, and the eastern portion was chosen.

I arrived in Whitby on the morning of Monday, June 10th. Having had my apparatus forwarded to this point, I was enabled to proceed immediately to work upon the plot which had been selected upon the farm of Mr. R. L. Huggard. The crop growing on this plot, which was an acre in area, was *Barley*, not seeded down. The barley was about three inches in height as also was the mustard. This field would not be in proper shape for spraying for a week; but, owing to the fact that my succeeding dates were fixed, I was compelled to accept the conditions as I found them, although I was perfectly aware that in this case a second and later spraying would be necessary, as many young seedlings which had not as yet shown themselves above the surface would soon do so. It is necessary that at the time of spraying the crop be sufficiently far advanced to smother any plants appearing after the operation.

The report as sent in by Mr. Huggard fully substantiates his contention.

Leaving Whitby on Monday evening, I arrived in Belleville and the following day, Tuesday, the 11th, I drove out to Foxboro' and gave a demonstration on the farm of Mr. John Thrasher. The crop growing in the plots sprayed was *Oats* ; and here again the mustard was hardly far enough advanced, only three or four leaves being unfolded. A plot of one acre was sprayed with a two-nozzle cluster, and a smaller area with the "Row sprayer." The latter, I believe, is preferable when a slow-walking horse is available. The report of Mr. Holgate is submitted. In a private letter received from Mr. H. R. Ross, he says in regard to this experiment: "Along with Mr. Thrasher I looked over the plots sprayed, and from what I saw we are both fully convinced that the experiment was a complete success."

The following day, Wednesday, the 12th, it was necessary for me to go to Caledonia to address a meeting, and hence it was Thursday before I reached Picton.

On Friday, June 14th, I gave a demonstration on the farm of Mr. J. Allison, near Yerexville, the crop in the plot being *Spring Wheat.* The wheat was about two feet high and the mustard had been in full bloom for some days. The spraying was done both with the two-nozzle cluster and with the row sprayer. Another small spot was sprayed in which the mustard was only about three inches high. The report as submitted by Mr. Yerex is appended.

The following day I left for Andrewsville, and on Monday, the 17th, I operated upon the fields of the farm of Messrs. Newman and Derrick. The plots of the former were in *Wheat* and *Oats.* The mustard was well out in bloom and the crop about six inches to one foot high. Two acres were sprayed. Those of the latter were in *Oats* and *Barley*, and the mustard was about four inches high. The results of the experiment were very satisfactory, and both of these gentlemen intend to carry out the operation upon a large scale. The report is submitted by Mr. Newman.

Owing to the great interest which my first demonstration had created, I decided to return to Prince Edward County. A couple of wet days materially interfered with my plans. On the 21st, I gave a demonstration upon the farm of Mr. J. A. Sprague, Demorestville. The crop in this plot was *Oats*, and the mustard was from five to six inches high. This test I consider most important, as the conditions were probably more favorable than at any other point of operation. The report of Mr. Sprague shows that, when taken at the proper time, the mustard can be entirely destroyed by this method.

The next day I went out to the "Sand Banks," about ten miles from Picton, with the intention of giving a demonstration at the "Grangers' Picnic" held there that day. However, owing to the immense crowd, the owner of the field in which I was to operate became alarmed lest his crop should be trampled under foot by the spectators. I therefore had to limit myself to a lecture on the subject. On Monday, the 24th, I returned to Toronto, but on the following day went back to Whitby, in order to fully convince the farmers of the effectiveness of this method, and also to correct some false impressions which had gone abroad. This was my last demonstration, and was given on the farm of Mr. R. L. Huggard on Saturday, June 9th. The report, as submitted by Mr. Huggard, is very satisfactory, and should go far to convince the "doubting Thomases" of that district that there are other methods of getting rid of mustard than those which they have been following for years.

THE METHOD DESCRIBED. After four years of experimenting with the "Bluestone Method" of destroying that noxious weed, commonly known in our western counties as "Wild Mustard," and in the east as "Herrick," we can, without the least hesitation, recommend it to farmers whose fields are badly infested. In cases where the mustard plants are sufficiently rare to admit of hand pulling, it will not be necessary to spray with the Bluestone solution. However, there are thousands of acres of fertile land in the Province which have become so badly infested that hand picking is impossible. To those we would say, take up this new method and go systematically to work to rid your farms of this pest, which is each year drawing from your fields enormous quantities of plant food, and involving you in serious loss from year to year.

The method is practicable where the ground is sown to oats, barley, or wheat, and no injury results either to the crop or to the young clover or timothy plants, if it be seeded down.

(*a*) *Time of Spraying*:

The exact date of spraying, of course, cannot be given, owing to the variations of

weather in our seasons. However, the exact stage in the development of the crop and the mustard at which the spraying is most effective has been ascertained. If it is the intention to make but one application, the solution should be applied after the mustard plants have produced a considerable leaf surface, but before they come into bloom. It is true that the mustard plants at this stage are not so susceptible to the spray as when they are less developed; but, if the spraying is done in this earlier stage, a second application is made necessary, because of the fact that the crop will not be far enough advanced to smother out the young mustard seedlings which will make their appearance after the operation. If the spraying is delayed until after the mustard comes into full bloom, some of the plants will mature seed and in this way lessen the effectiveness of the treatment.

The spraying should be done on a calm, bright day. A heavy shower of rain coming immediately after the operation will make a second spraying necessary.

(*b*) *Preparation of Solution :*

Place ten pounds of Copper Sulphate, or "Bluestone", in a coarse bag and suspend it in about three gallons of boiling water. The crystals will be entirely dissolved in from fifteen to twenty minutes. Strain the solution into the pump barrel, and fill up with cold water to forty or forty-five gallons. Apply this quantity to each acre.

(*c*) *Method of Applying Solution* :

The best method of applying the solution is with an ordinary barrel spray pump, such as is used for the spraying of fruit trees. Place this in a cart or light wagon and drive slowly through the field, applying the chemicals in such a way that all the mustard will be wetted. The "Bamboo Rod Attachment" with a two or three cluster nozzle will do the work very effectively, but not so rapidly as the "Extension Rod Attachment", attached to the back of the cart or light wagon

Your results will depend almost entirely upon the throughness with which you do the spraying.

Some Advantages of This Method.

(1) It is practicable where hand pulling is not.

(2) If carried out thoroughly for four years, all the mustard which remains can easily be pulled.

(3) It makes it possible to exterminate this pest without missing a season's crop.

(4) The increase in the yield of grain, which results from the increase in the fund of plant food placed at the disposal of the crop, owing to the mustard plants having been killed, will usually cover all expense connected with the operation.

(5) The original outlay amounts annually to only eighty cents per acre.

OPINIONS OF CORRESPONDENTS.

Dear Sir,—Your letter of the 19th received, and in reply would say that the spraying to kill the mustard was a perfect success; that is the last spraying. The first time all was killed that was sprayed, but some came on later, but the last time was a perfect success. Many inquiries were made by the people, who noticed the sprayed portion, and it was hard to convince them that the oats were not injured. In about three days after spraying, the plot had a brown appearance, and the passerby thought that it was the grain that was killed, but a closer inspection plainly showed them their mistake.

I think to do the job properly, the field of mustard should be sprayed twice, or perhaps if a little more time were taken so as not to miss a stalk with the spray, once would do. One thing is certain, however, the sulphate will kill the mustard without injury to the oats, barley or wheat.

R. L. Huggard, Whitby.

Dear Sir,—In reply to your inquiry as to the effect of spraying on the mustard and the crop on my farm, I have to say that the mustard was all killed; and, strange to say, it seemed to disappear. The oats were affected slightly on some of the tender leaves, but in a few days had fully recovered, and at harvest time were better than where the mustard was left and allowed to grow. I am fully convinced that spraying will destroy all mustard, and the crop will be sufficiently increased to pay all expenses in connection therewith. John A. Sprague, Demorestville.

Dear Sir,—Your letter in which you desired information regarding the results of mustard spraying demonstration, was duly received, but as I was at that time away from home and my mail was not forwarded to me, I did not receive your letter until I arrived home last week. Before I left home, I had, however, been over the field which had been sprayed. The first field sprayed I inspected first. As you remember, some of the mustard had advanced so far that they already had seed pods upon them. These were the only plants of which I could find any trace. The other plants had been totally destroyed and could not be distinguished. In the other field where the mustard was very small, I could find no traces of the mustard, as it had been totally destroyed and the sun had completely dried the plants up. W. L. Yerex, Picton.

Dear Sir,—I received your letter some time ago, and I have been so busy that I have not had time to go down and see the experiment before. I was down one night last week and saw it. I may say that Mr. Thrasher and I both think it was a success, and would have been a greater success had not the wet weather started a lot more seed growing. We cannot see any injurious effects on the grain, and now the crop is better where it was sprayed than where it was not sprayed. Thomas Holgate, Foxboro'.

Dear Sir,—I am very much pleased indeed to be able to send in such a favorable report on the result of the spraying of wild mustard as carried on here by you in June.

The solution you made was very effective indeed, and a good deal of enthusiasm has been created over this quick and economical method of eradication. In two or three days after you sprayed, the mustard plants turned very brown, and they continued to get a deeper color until they were almost black. The leaves of the grain (oats and wheat mixed) also got slightly brown, but this passed off in a few days without apparently injuring the grain.

A duplicate plot or strip of grain was left in the same field unsprayed, to see if there was any difference in the growth after spraying. This difference was very marked, for as soon as the growth of the mustard plants was checked, the grain grew very rapidly and went ahead of the unsprayed strip very quickly. I am sure that the increase in yield by spraying more than covered all expenses connected therewith. L. H. Newman, Andrewsville.

The Herbarium and Systematic Botany.

For several years past very little attention has been given to the bringing together of a representative collection of our Ontario plants The cause, no doubt, was, not that the value of such a collection was not appreciated, but rather that entomological problems demanded attention during the summer months. In an institution of this kind, where information is being continually sought for by farmers and others regarding the indentification of specimens, it is very necessary that a complete collection should be available. It is also desirable, and in fact essential, to the giving of a practical course in Systematic Botany to our students, that they should have dried specimens to examine. The specimens used for analysis in our courses in Systematic Botany are preserved in alcohol and formalin. Work was begun during the past summer upon the flora of Guelph and its vicinity, and a small collection of 67 species, representing fifty six genera, was added to the herbarium. It is hoped that, in a few years, we shall be able to publish a complete flora of Wellington County.

The past few years have been marked by a very rapid increase in the population of New Ontario. This means that within a very short time, the nature of the flora of this part of the Province will be vastly changed ; and, unless expedition is sent to make a study of the natural flora of this district, much valuable data and no doubt many rare species will be lost to us. We hope that during the summer of 1902, we may be enabled to spend a few weeks in the northern part of the Province making collections and studying the flora and fauna. Without doubt, much valuable information would be gained from such an undertaking and considerable interesting material gathered together, which could be placed in our new museum.

PLANTS PLACED IN THE HERBARIUM, 1901, WELLINGTON COUNTY FLORA.

Germs.	Species.	Where Found.	Month.	Day.	Common Name.
Aster	sagittifolius	Speed Bank, south of Sleeman's	9	21	Aster.
Aster	puniceus	R. Crane's Flats	9	12	Purple-Stem Aster.
Alisma	plantago	Stone's Swamp	7	8	Water Plantain.
Actea	alba	Dairy Bush, O.A.C	6	6	White Baneberry.
Arisaema	triphyllum	No. 19 Bush, O.A.C	6	5	Indian Turnip.
Actea	rubra	Dairy Bush, O.A.C	6	6	Red Baneberry.
Autennaria	plantaginifolia	Stone's Farm	6	1	Everlasting.
Amelanchier	Canadensis	Above Pipe's Dam, 1st Cross-road	5	11	Shad-Bush.
Anemone	nemorosa	River Bank, above Pipe's Dam	5	11	Wind-Flower.
Alopecurus	geniculatus	Stone's Swamp	6	1	Floating Foxtail.
Cicuta	maculata	Stone's Swamp	7	8	Spotted Cowbane.
Chelone	glabra	Paradise, River Speed	8	17	Turtle's Head.
Carduus	nutaus	North of Stone's House	10	21	Musk Thistle.
Carduus	...	Road Side, rear of Dairy Bush	10	15	
Cynoglossum	officinale	College Heights—Keough's	6	4	Hound's Tongue.
Carex	gracillinia	No. 19 Bush, O.A.C	6	5	
Caulophyllum	thalictroides	Dairy Bush, O.A.C	5	2	Blue Cohosh.
Capsella	bursa-pastoris	College Fields	5	15	Shepherd's Purse.
Cerastium	viscosum	Behind Sleeman's Brewery	5	27	Mouse-Ear Chickweed.
Carex	..	Dairy Bush, O.A.C	5	2	
Cishorium	Intybus	Road Sides	9	12	Chicory.
Claytonia	Caroliniana	Dairy Bush, O.A.C	..	..	Spring Beauty.
Carex	intumesceus		..	..	
Chelidonium	majus	Swamp, near McCrae's	7	9	Celandine.
Dicentra	Canadensis	River Bank, above Pipe's Dam	5	11	Squirrel Corn.
Dicentra	cucullaria	Puslinch Bush, O.A.C	4	30	Dutchman's Breeches.
Diplotaxis	muralis	Kent County	..	..	Sand Rocket.
Dirca	palustris	Hart's Bush	4	30	Leatherwood.
Epilobium	augustifolium	Stone's Road-side	7	8	Great Willow Herb.
Erysimum	cheiranthoides	R. Crane's Flats	5	27	Worm Seed Mustard.
Erythronium	Americanum	Dairy Bush, O.A.C	..	..	Dog Tooth Violet.
Fragaria	Virginiana	No. 19 Bush, O.A.C	6	5	Wild Strawberry.
Geum	strictum	Stone's Swamp	7	8	Avens.
Glyceria	fluitaus	Stone's Swamp	7	8	
Galium	aparine	Puslinch Bush, O.A.C	5	27	Cleavers.
Hydrophyllum	Virginicum	Experimental Bush, O.A.C	5	27	Water-Leaf.
Lactuca	scariola	North London	10	..	Prickly Lettuce.
Lolium	perenne		..	..	Perennial Rye Grass.
Medicago	lupulina	Fields and Roadsides	6	1	Black Medick.
Mitella	diphylla	Dairy Bush, O.A.C	5	10	Bishop's Cap.
Osmorrhiza	brevistylis	R. Crane's, River Bank	5	27	Hairy Sweet Cicely.
Pyrola	rotundifolia	Stone's Swamp	7	8	Wintergreen.
Phlox	divaricata	Puslinch Bush, O.A.C	5	15	Wild Phlox.
Prunus	Virginiana	Near Lime Kiln—Sleeman's	5	27	Choke Cherry.
Polygonatum	biflorum	Experimental Bush, O.A.C	5	28	Solomon's Seal.
Ranunculus	Pennsylvanicus	Stone's Swamp	7	8	Bristly Crow-foot.
Ranunculus	scleratus	Stone's Swamp	6	1	Cursed Crow-foot.
Rumex	crispus	Fields, O.A.C	6	5	Curled Dock.
Sowchus	arvensis	Kennan's Field	7	8	Perennial Sow-thistle.
Sanguinaria	Canadensis	Dairy Bush, O.A.C	4	25	Blood-Root.
Sedum	acre	Macdonald's Field on Brock Road	7	4	Mossy Stone-Crop.
Scutullaria	galericulata	Stone's Swamp	7	8	Skull Cap.
Silene	noctiflora	Field No. 1, O.A.C	6	6	Night Flowering Catch-fly.
Sambucus	Canadensis	River Bank—Sleeman's	..	..	Elder.
Smilacina	stellata	Experimental Bush, O.A.C	5	28	False Solomon's Seal.
Smilacina	racemosa	Experimental Bush, O.A.C	5	28	False Spikenard.
Solanum	rostratum		..	..	Prickly Solanum.
Scleranthus	annus	Grain Field, near Paris	..	..	German Knot-Grass.
Thalistrum	polygamum	Bank of River Speed	7	9	Tall Meadow Roe.
Tiarella	cordifolia	No. 19 Bush, O.A.C	6	5	False Mitre-wort.
Trillium	erectum	River Bank, above Pipe's	5	11	Wake Robin.
Taraxacum	taraxacum	College Campus	5	10	Dandelion.
Viola	Canadense	River Bank, above Pipe's	5	11	Canada Violet.
Viola	blanda	Puslinch Bush, O.A.C	5	15	Sweet White Violet.
Viola	pubescens	Dairy Bush, O.A.C	5	10	Downy Yellow Violet.
Viola	Selkirkii	McAllister's Swamp	5	6	Great Spurred Violet.
Waldsteinia	fragarioides	Sleeman's Park	5	7	Barren Strawberry.

Bird Notes

The past season has certainly been an encouraging one for those of our citizens who took an interest in the welfare of our feathered friends. While, so far as I have yet learned, very few new species have been reported, yet many of our most beneficial varieties showed a marked increase in numbers. For instance, the trim little Bluebird (*Sialia sialis*) and the bright plumaged Baltimore Oriole (*Icterus galbula*), both of which are desirable from an economic and aesthetical standpoint, showed a marked increase in numbers. This I believe to be one of the first fruits of a popular sentiment adverse to the destruction of such active friends by the bloodthirsty "small boy," and the pecuniary-spirited bonnet decorator, which of late has grown to such proportions among the general public. With the exercise of vigilance by the proper authorities, and the continuance of the "Bird Protection" crusade, I think that our insectivorous friends will have become so numerous that our insect enemies will cause us less trouble. Every effort will be made in our work here to stimulate the growth of a spirit of appreciation of the valuable work done by birds in the destruction of injurious insects and weed seeds.

Many erroneous ideas prevail among agriculturists regarding the relative amount of good and injury done by many of our abundant species. As we study more and more closely the habits of birds, we are more and more convinced that the general result of their existence is acting strongly as a material benefit to farmers and horticulturists, and the list of "condemned species" grows shorter from year to year.

The causes for the prevalence of erroneous ideas regarding our birds are many and widely different. Chief among them may be mentioned: 1st, The injury they do, if any, is apparent, while the good they do is frequently indirect and as a result more or less obscured to the superficial observer ; 2nd. Whole classes of birds are condemned because they have among their numbers one or two species of pernicious habits, *e.g.*, indiscriminate slaughter of hawks, owls and sparrows is frequently advocated, and yet when the economic status of the various species of these classes have been definitely determined, we learn that while but very few are wholly injurious, the vast majority are highly beneficial to agriculture, in that they feed largely upon rodents and weed seeds.

If there is any one class of birds which in the mind of the general public is unconditionally condemned, it is "Sparrows." For the past two years I have been studying the habits of our sparrows and making examinations of their stomach contents ; and although my observations are as yet very incomplete, I can say that there is not a single species wholly injurious, while, as a class, they stand unrivalled as weed destroyers and quite high in the list as destroyers of injurious insects.

The common species of this part of the Province are:

The Song Sparrow, Chipping Sparrow, Vesper Sparrow, Tree Sparrow, Field Sparrow, Savanna Sparrow, White Throated Sparrow, Swamp Sparrow, Fox Sparrow, and English Sparrow, the last being an imported species (*Passer domesticus*), and the one chiefly accountable for the disreputable name borne by the whole class.

Elsewhere in this volume will be found illustrations of two species, viz., the Tree Sparrow (*Spizella monticola*) and the White Throated Sparrow (*Zonotrichia albicollis*). Both of these feed largely upon the seeds of such plants as pigweed, lamb's quarters, ragweed, barnyard grass, and chickweed. The latter also feeds to some extent upon various wild berries and also insects ; while the value of the former lies chiefly in the fact that it is an abundant species and great destroyers of weeds.

Bird Migrations.

Below I have given in tabulated form "Migration Notes for 1901", and the "First Arrivals for the Past Five Years". For much of this valuable information I am indebted to Messrs. Norman Beattie and Smith Walker, members of the Wellington Field Naturalist Club, of which Club I have the honor to be President.

Migration Notes for 1901.

Name of Bird.	When was it first seen?	About how many w'reseen	When was it next seen?	When did it become common?	When was it last seen?	Is it common or rare?	Does it breed near your st'n?	Remarks.
Mallard Duck	Feb. 18	1	Mar. 24			Not rare	Yes	
Prairie Horned Lark	Feb. 26	2	Mar. 1	Mar. 9		Common	Yes	Very common in early spring.
American Crow	Feb 24	7	Feb. 28	Mar. 12		Common	Yes	Very abundant.
American Goldfinch	Feb. 28	30	Mar. 16	Apr. 12		Common	Yes	
American Merganser	Mar. 4	1	Mar. 9			Rare	No	Seen in Speed River.
Downy Woodpecker				Resid't		Common	Yes	Nest with young found June 9th.
Hairy Woodpecker				Resid't		Common	Yes	
White Br'sted Nuthatch				Resid't		Common	Yes	
Red Breasted Nuthatch						Rare	Yes	Pair noted breeding.
Brown Creeper	Mar. 9	4	Mar. 10	Apr. 11		Common	Yes	
Slate Colored Junco	Mar. 9	20	Mar. 10	Apr. 11		Common	Yes	
Sharp Shinned Hawk	Mar. 15	1	Mar. 30			Rare	Yes	
Blue Bird	Mar. 16	1	Mar. 23	Mar. 26	Oct. 22	Common	Yes	Becoming plentiful.
American Robin	Mar. 18	1	Mar. 19	Mar. 25		Common	Yes	
Song Sparrow	Mar. 23	1	Mar. 24	Mar. 26		Common	Yes	
Meadow Lark	Mar. 23	1	Mar. 25	Apr. 5		Common	Yes	
Golden Crowned Kinglet	Mar. 23	3	Mar. 30	Apr. 10		Common	?	Common in spring and fall.
Killdeer Plover	Mar. 23	3	Mar. 25	Apr. 10	Oct. 24	Common	Yes	
Bronzed Grackle	Mar. 25	10	Mar. 26	Mar. 26		Common	Yes	
Rusty Grackle					Sept. 14		No	More common in fall.
Tree Sparrow								Winter visitor.
Phoebe	Mar. 26	1	Mar. 30	Apr. 8		Common	Yes	More common in 1901.
Chipping Sparrow	Mar. 27	4	Apr. 19		Oct. 19	Common	Yes	
Vesper Sparrow	Mar. 28	1	Apr. 9	Apr. 13		Common	Yes	
Cow Bird	Mar. 30	5	Apr. 8	Apr. 16		Common	Yes	
White Rumped Shrike	Mar. 30	2	Apr. 9			Common	Yes	
Cooper's Hawk	Mar. 30	1	Apr. 14			Common	Yes	
Red Shouldered Hawk	Mar. 30	1	Apr. 9	Apr. 11		Common	Yes	
Great Blue Heron	Apr. 6	1	Apr. 9	Apr. 9	Oct. 24	Common	Yes	
Ruffed Grouse			Resid't			Common	Yes	
Sparrow Hawk	Apr. 9	1	Apr. 11			Common	Yes	
Red Winged Blackbird	Apr. 9	1	Apr. 11			Common	Yes	
Blue Jay			Resid't			Common	Yes	More common in spring and fall.
Great Horned Owl			Resid't			Rare	Yes.	
Fox Sparrow								Winter visitor.
Yellow Bellied Sapsuck'r	Apr. 13	2	Apr. 20			Common	Yes	
Kingfisher	Apr. 14	1	Apr. 17			Common	Yes	
Purple Finch	Apr. 16	1	Apr. 27	May 4	Oct. 19	Common	Yes	
Canada Goose	Apr. 17	4			Nov. 7			Passing migrant.
Wilson's Snipe	Apr. 17	1	Apr. 19		Oct. 20	Not rare	No	Passing migrant.
Tree Swallow	Apr. 17	1	Apr. 28		Sept. 9	Numer's	Yes	
Flicker	Apr. 17	1	Apr. 18			Common	Yes	
Ruddy Duck	Apr. 23	1				Rare	No	Passing migrant.
White Throat'd Sparrow	Apr. 14	2	Apr. 28	Apr. 30	Oct. 18	Common	Yes	
Savanna Sparrow	Apr. 23	1	Apr. 25	Apr. 29		Common	Yes	
American Bittern	Apr. 23	1			Oct. 17	Common	Yes	
Ruby Crowned Kinglet	Apr. 23	2	Apr. 27	May 7		Common	No	
Winter Wren	Apr. 24	4	Apr. 25			Not com.	Yes	
Barn Swallow	Apr. 28	10	Apr. 29	Apr. 29	Sept. 10	Common	Yes	
Palm Warbler	Apr. 28	2			Sept. 10	Not com.	No	Passing migrant.
American Woodcock	Apr. 28	6			Oct. 20	Not com.	Yes	
Chimney Swift	Apr. 29	1	Apr. 30	May 5	Sept. 1	Common	Yes	
House Wren	Apr. 30	1	May 3	May 7		Common	Yes	
Blk Thr'ted Gr. Warbler	Apr. 30	1	May 4	May 14		Common	Yes	
Cat Bird	May 1	2	May 4	May 4		Common	Yes	
Morning Dove	May 1	2					Yes	
Red Eyed Vireo	May 3	1	May 7	May 24		Common	Yes	
Black & White Warbler	May 4	3	May 14	May 24		Common		
Least Fly Catcher	May 5	1	May 6	May 8		Common	Yes	
Yellow Warbler	May 5	1	May 15	May 17		Common	Yes	
Screech Owl			Resid't			Common	Yes	
Baltimore Oriole	May 8	3	May 9	May 10		Common	Yes	Probably more common than usual.
White Crowned Sparrow	May 10	2				Not com.		
Bobolink	May 10	12	May 11	May 11	Sept. 9	Common	Yes	
Crested Fly Catcher	May 11	1	May 12	May 12		Common	Yes	
Myrtle Warbler	May 14	4	May 24	May 24	Oct. 18	Common		
Black Billed Cuckoo	May 14	1	May 18	May 22		Common	Yes	

MIGRATION NOTES FOR 1901.—*Continued.*

Name of Bird.	When was it first seen?	About how many w're seen	When was it next seen?	When did it become common?	When was it last seen?	Is it common or rare?	Does it breed near your st'n?	Remarks.
Wood Pewee	May 14	1	May 18	......	......	Common	Yes	
Night Hawk	May 16	1	May 21	May 27	......	Common	Yes	
Yellow Billed Cuckoo	May 17	1	May 22	May 22	......	Common	Yes	
Red Headed Woodpecker	May 19	1	May 19	......	......	Common	Yes	
Least Sandpiper	May 19	1	......	......	......	Rare	No	Passing migrant.
Wilson's Warbler	May 24	1	......	......	......	Rare	No	Passing migrant.
Redstart	May 24	2	......	......	......	Common	Yes	
Maryland Yellow Throat	May 24	3	......	......	......	Common	Yes	
Bay Breasted Warbler	May 24	10	May 25	May 26	......	Not com.	No	Passing migrant.
Blackburnian Warbler	May 24	6	May 26	......	......	Not com.	No	Passing migrant.
Chestnut Sided Warbler	May 24	3	May 26	......	......	Common	Yes	
Warbling Vireo	May 24	10	May 25	......	......	Not rare	Yes	
Wood Thrush	May 24	1	......	......	Oct. 18	Not com.	Yes	
Wilson's Thrush	May 24	3	......	May 24	......	Common	Yes	
Blue Headed Vireo	May 25	1	......	......	......	Very rare	No	
Olive Backed Thrush	May 25	1	......	......	......	Rare	Yes	
Scarlet Tanager	May 25	1	......	......	......	Not com	Yes	
Magnolia Warbler	May 26	1	......	......	......	Not com.	No	Passing migrant.
Ruby Thtd. Hum'g Bird	June 3	1	......	......	Sept. 20	Not com.	Yes	

BIRD MIGRATION.—*Spring Dates of First Arrivals.*

NAME.	1897	1898	1899	1900	1901
Prairie Horned Lark	Feb. 17	Feb. 18	Feb. 20	Feb. 8	Feb. 26
American Crow	2—22	2—22	2—15	2—22	2—24
Chickadee	......	......	......	......	......
Rough Legged Hawk	2—27	......	......	......	......
Pine Grosbeak	3—5	......	2—24	2—10	......
American Merganser	......	......	......	......	3—4
R. Downy Woodpecker	......	......	3—10	......	3—4
R. Hairy Woodpecker	......	......	3—3	2—10	3—4
R. White Br. Nuthatch	......	......	3—19	2—27	3—9
Brown Creeper	......	......	......	......	3—9
Slate Colored Junco	3—25	......	2—15	......	3—9
Red Shouldered Hawk	3—25	......	......	......	3—30
Sharp Shinned Hawk	......	......	......	4—16	3—15
Cooper's Hawk	......	......	......	4—16	3—30
American Goldfinch	......	......	3—10	......	2—28
American Robin	3—8	3—7	3—11	3—29	3—18
Blue Bird	3—10	3—16	3—12	3—29	3—18
Cedar Waxwing	3—13	......	4—27	......	......
Killdeer Plover	3—21	3—17	4—4	3—31	3—23
Meadow Lark	3—21	3—19	4—5	4—3	3—23
Bronzed Grackle	3—22	3—17	4—5	4—1	3—25
Song Sparrow	3—22	3—14	3—14	3—8	3—23
White Rumped Sprike	3—23	3—28	4—10	4—7	3—30
Golden a'd Knight	......	......	4—22	4—13	3—23
Red Winged Blackbird	3—26	4—8	4—11	4—24	4—9
Great Blue Heron	3—26	3—19	4—10	4—7	4—6
Mallard	3—29	3—21	3—24	......	3—24
Flicker	3—30	3—16	4—12	4—12	4—17
Blue Jay	......	3—16	4—17	3—31	4—10
Purple Finch	3—18	4—25	3—17	5—2	4—27
Canada Goose	......	......	3—11	......	4—17
Cow Bird	4—2	4—11	4—18	5—5	3—30
Pied Billed Grebe	......	......	4—27	......	......
Vesper Sparrow	4—2	......	4—14	4—9	3—28
Chipping Sparrow	4—2	......	4—22	4—19	3—27
Sarauna Sparrow	4—7	3—28	......	......	4—23
Phoebe	4—11	3—28	4—15	3—3	3—26
Yellow Bellied Sap Sucker	4—11	......	4—22	4—15	4—13
House Wren	4—29	......	4—16	......	4—30

NOTE.—In each of the columns the first figure denotes the month of the year, and the second figure the day of the month, *e.g.*, 5—16 May 16th.

BIRD MIGRATION.—*Continued.*

NAME.	1897	1898	1899	1900	1901
Marsh Hawk	May 29		May 28		
White Throated Sparrow	4—14	4—29	4—25	4—28	4—28
Sparrow Hawk	4—23				4— 9
Towhee	4—23			5— 6	
Swamp Sparrow	4—23		5— 3		
Barn Swallow	4—25	4—16	4—22		4—28
Tree Swallow		4—18	4—14		4—17
King Fisher	4—25	4— 8	4—17	4—16	4—17
Spotted Sandpiper	4—26		4—29	4—21	4—29
Yellow Warbler	4—27	5— 3	4—30	5—10	
Red Headed Woodpecker		5— 8	4—19	5—12	
Bay Breasted Warbler			4—22		
Black and White Warbler	5— 2	5— 4	4—22	4—22	
Virginia Rail					
Sora Rail					
Wilson's Snipe			4—25		4—17
King Bird	5— 9	5—13	4—27	5— 8	
Chimney Swift	5— 3	5—11	4—27	4—24	4—29
Cat Bird		5—15	4—29	5—10	
Bobolink	5— 3		5— 2	5—10	
Least Fly Catcher	5— 9		4—29	5— 8	
Baltimore Oriole	5— 9	5— 6	5— 2	5— 8	
Wood Pewee	5—20	5— 7	5— 3		
American Bittern	5—28	5— 8		4—23	4—23
Red-eyed Vireo	5— 9	5—13	5— 4		
Myrtle Warbler			5— 4	4—30	
Whip-poor-will	5—30		5— 5		
Brown Thrasher	5—10		5— 7	5— 6	
Oven-bird	5— 3	5—12			
Scarlet-Tanager	5— 9		5—11		
Warbling Vireo	4— 8				
Black Billed Cuckoo	5—26		5—11		
Traill's Flycatcher	5—26				
Rose Breasted Grosbeak	5— 9	5— 4	5—11		
Black Throated Blue Warbler	5—10			5— 5	
Canadian Waroler	5— 9		5—11		
Chestnut Sided Warbler	5— 9		5—11	5— 5	
Wood Thrush	5—13				
Black Burman Warbler			5—11	5— 8	
Black Throated Green Warbler	5— 3	5— 4	5—11	5— 8	4—30
Indigo	5—16				
Magnolia Warbler			5—11		
Mourning Warbler	5—16			5— 8	
Water Thrush	4—30		5—11		
Maryland Yellow Throat	5— 9			5— 9	
Night Hawk			5—11		
Wilson's Thrush			5—16		
Cliff Swallow			5—18		
Crested Flycatcher	5—10		5—18		
Ruby Throated Hummer	6— 8				
Bank Swallow				4—27	
Red Start	5—21				
Yellow Throated Vireo					
Green Heron					
White Crowned Sparrow					
Yellow Legs					
Solitary Sand Piper					
Ruby Crowned Ringlet					4—23
Winter Wren					4—11
American Woodcock					4—28
Palm Warbler					4—30

MANNING W. DOHERTY,
Associate Professor of Biology

PART V.

REPORT OF THE PROFESSOR OF CHEMISTRY.

To the President of the Ontario Agricultural College :

SIR,—I beg to submit herewith my first annual report of the work done in the Department of Chemistry.

On the 28th of October, 1901, Dr. Shuttleworth resigned his position as head of this department. The next day I was informed that I had been promoted to fill the vacancy, the appointment to date from the 1st of November. While it is thus only a month since I took charge of the department, my report will deal with all the work of the year, with the exception of the experiments in sugar beet cultivation. Dr. Shuttleworth had special charge of these experiments, and will make a full report of the work.

During the past year no special changes have been made in the instruction given the first and second year students. The extension of the work for the B.S.A. degree from a course of three years to one of four has made it possible to give all the third year men a better training in qualitative analysis, and to give them considerable gravemetric work. They were also able to make fodder and water analyses.

In former years, four lectures, dealing principally with elementary chemistry, were given to the students of the dairy school. Last year, eight lectures, dealing more directly with the chemistry of milk and its products, were delivered and each student received fifteen days' practical instruction in the laboratory. The practical course covered the following points: The separation of the water, casein, albumen, sugar, fat, and ash of milk; simple experiments showing the effect of lack of ash constituents in milk on the coagulation with rennet ; and the difference between rennet and acid coagulation ; analyses of butter ; methods of detecting the purity of butter ; preservatives in milk ; the purity of salt ; preparation and use of the alkaline solution. Determinations were also made of the percentage of acid in milk and in whey at the various stages in the making of cheese.

OUTSIDE WORK.

Last spring a joint circular was issued by the Dairy, Bacteriological, and Chemical Departments, a copy of which appears in the report of the Professor ot Bacteriology, in which these departments offered to co-operate with cheese-makers, butter-makers, and dairymen in general, to discover the causes of difficulties that might arise, and offering to furnish pure cultures and alkaline solutions at a nominal cost. A number of responses were received and help was given ; and this is a line of work we are desirous of continuing. We therefore invite all dairymen having difficulties in the handling of milk, or in its manufacture into cheese and butter, to communicate with us.

WATER ANALYSES. Over thirty samples of drinking water have been analysed during the year. While a majority of the waters proved, on analyses, to be good for domestic purposes, a number, especially when taken from old wells near the house or outbuildings, were badly contanimated with soakages of one kind and another and with sewage. The ground acts as a filter, purifying the water that passes through it, for a long time ; but the time comes at length when, through saturation with filth, it looses its purifying power and the impure water makes its way into the well.

This fall, owing to the dry weather, the water in many wells is very low ; and, consequently, there is a concentration of impurity wherever it exists. In numerous cases of sickness, we have been requested to analyse the water ; in fact, during the last ten days, seven samples have been analysed and more are now on their way to the laboratory. While this class of work is of value to the individual for whom it is done, our work should be of a broader nature, devoted more to problems which underlie principles. I feel, therefore, that in justice to the work of the laboratory, general water analyses should be discontinued ; and I would recommend that, in future, analyses be made only of water from cheese factories and creameries, and that applications from all other sources be referred to chemists who make a business of doing that class of work.

SOAP ANALYSIS. On March 9th, Mr. Geo. Fisher, Chief Inspector of San José Scale for Ontario, sent a sample of soft soap to the laboratory for analysis. This soap was afterwards used in large quantities in spraying for the scale, and gave good results where properly applied:

Moisture	75.02 Per Cent.
Combined fatty acids	12 44 "
Alkali (K_2O and Na_2O) in combination	2.62 "
Free Potash and Soda (K_2O and Na_2O)	.75 "
Unsaponified fat and free fatty acids	7.36 "
Alkali (K_2O and Na_2O) as carbonates, etc	1.81 "
Carbonates (CO_2)	not determined.
Insoluble residue	None.

The total alkali present in the above sample is 5.23 per cent., composed of K_2O 3.21 per cent and Na_2O 2.02 per cent.

SORGHUM ENSILAGE. A sample of sorghum ensilage was sent to us from the farm of F. W. Hodson, Dominion Live Stock Commissioner, Myrtle, Ont., accompanied by a request that we determine its composition, so that a comparison of the feeding value might be made between it and corn ensilage. In the table given below, the average of a number of American analysis is included.

——	Crude Protein.	Nitrogen-free Extract.	Crude fibre.	Crude Fat.	Ash.
Corn Ensilage, Average of 99 Analysis	8.0	53.0	28.7	3.8	6.6
Sorghum Ensilage, Average of 6 Analysis	3.3	61.2	26.8	1.3	4.4
Sorghum Ensilage, from Mr. Hodson's farm	6.9	57.6	25.5	3.8	6.2

These results show Mr. Hodson's sorghum to have been much richer in crude protein and crude fat than the American samples. This, however, is the result of only one analysis, compared with six. The sorghum was reported to have yielded fully one half more than the ordinary ensilage corns. For full particulars regarding yield of different varieties of sorghum, see report of Experimentalist.

A number of odd samples of substances were analysed, the results of which are not of sufficient importance to the public to record here.

WORK WITH THE POULTRY DEPARTMENT.

At the request of Mr. Graham, Superintendent of the Poultry Department, we made an analysis of some foods which he was using in a feeding experiment. The table of analysis is given below, and the results of the feeding experiment will be found in the Report of the Poultry Department:

Analysis of Grains.

——	Moisture.	Fat.	Crude Fibre.	Nitrogen Free Extract.	Total Protein.	Albuminoids.	Amides.	Ash.
	Per cent.	Per cent	Per cent	Per cent.	Per cent	Per cent	Per cent	Per cent
White Oat Dust	12.13	6.03	5.805	59.715	14.42	13.252	1.168	1.90
Oats coarsely ground	8.425	3.165	13.395	59.635	12.38	11.488	.812	3.00
Oats Kiln dried	9.92	2.15	14.56	57.765	11.595	10.894	.701	4.01
Pearl Oat Dust	13.35	5.20	4.10	63.51	11.99	10.45	1.54	1.85
Gluten Meal	2.235	7.97	5.13	59.53	24.36	....	....	.775

Work with the Experimental Department.

Last year, and again this year, the per cent. of sugar was determined in a number of sugar beets grown on the experimental plots. The varieties analysed were principally those grown for cattle food, but a few of those usually raised for sugar were included. The method of cultivation followed was similar to that practised on Ontario farms in raising roots for stock purposes. The object of the analysis was to obtain results which would make it possible to compare the feeding value of the beets upon a basis of the amount of sugar they contain and the yield in tons per acre. The percentage of sugar in the beets and the percentage of the solids which is pure sugar, are given in the following table. The yield of beets per acre will be found it the report of the Experimentalist, Part XI., of this volume. The per cent. of sugar found in the common large varieties of sugar beets was unusually high, due to the exceptionally fine weather of the past fall:

Per cent. of sugar in Sugar Beets grown for feeding purposes.

	Varieties.	Average weight of Tared Beets.	Per cent. Sugar in Beets.	Purity.
		oz.	Per cent.	Per cent.
1	Red Top	22.8	10.9	81.5
2	Red Skinned	20 5	9.6	78.4
3	White Silesian	15.7	14.5	86.9
4	New Danish Improved	21.2	11.4	81.6
5	Green Top White	21.4	13.6	83 2
6	Lane's Improved	13.1	11.6	80.9
7	Champion	18.8	9.8	74.2
8	Royal Giant	20.7	10.4	83.3
9	Giant Red Half Sugar	19.6	9.6	85.0
10	White French	16.8	14.4	83.5
11	Giant White Half Sugar	21.4	9.0	74.7
12	Pitzseheke's Elite	16.2	15.8	82.6
13	Jersey	17.5	15 6	88.7
14	French Yellow	16.2	13.3	85.2
15	Carter's Nursery	15.8	16.1	87.6
16	Improved Imperial	17.4	16.3	86.4
17	Imperial Grey Top	14 8	14.9	85.7
18	Queen of the Danes	15.4	13.3	84.8
19	Vilmorin's Improved	13.1	16.8	88.9
20	Kleinwauzlbener (seed from Wiarton, Ont., 1900)	18.3	15.2	88.0
21	Kleinwauzlbener (seed from Caro, Mich., 1901)	14.6	14 0	77.9
22	Kleinwauzlbener (seed from Scranton, Pa., 1901)	13 7	17.2	89.1
23	Kleinwauzlbener (seed from Aylmer, Ont., 1900)	18 7	17.5	89.8
24	Vilmorin's French Sugar	15.7	14.0	83.6
25	Mangold Kuaver	21.9	17.7	....

Work with the Dairy and Bacteriological Departments.

Last spring this department, in conjunction with the two above named departments, commenced a study of the effect of curing cheese in cold storage upon (1) quality of cheese, (2) germ life, and (3) the decomposition products of the nitrogenous matter of the cheese as compared with that from the ordinary method of curing. The work is not yet completed, so no definite results can be given.

Another line of investigation was undertaken by the three departments with a view to determine what causes the breaking down of the casein in the curing of cheese. Although cheese has been made and used for many centuries, this point is still in dispute. Some claim that it is the pepsin of the rennet, others that it is the lactic acid developed in the process of manufacture, and still others that it is brought about by a ferment found in the milk. It is evident that until we know more definitely what causes the breaking down of the curd, or casein, we cannot intelligently control the curing process. This work is nearly completed and will be ready for publication in a few weeks

For some time past cheesemakers have manifested much interest in the question of the advisibilty of washing tainted curds, and the consequent effect upon the quantity and

quality of the cheese. That tainted curds are improved by washing is practically established, but its effect upon the yield of cheese has not been so clearly proven. Prof. Dean has made a large number of experiments to clear up this point, a full account of which will be found in his report for the year.

Following up this line of investigation, we have determined the loss of casein and fat and the effect upon the acid when curds are washed. The plan of the experiment was as follows:

Eight hundred pounds of milk was carried through the ordinary process of manufactuse until immediately after milling, when the freshly milled curd was weighed and evenly divided, after which it was piled about 8 inches deep in the racks in the small experimental vats. One lot was at once washed with water at a temperature of 98° F., as many pounds of water being used as there were pounds of curd. The other lot was treated in the ordinary way. All of the drippings, including the wash water, was caught from both vats up to the time of salting. From this point to the time the cheese was taken from the hoops another collection was made of all the drippings and fat on cheese boards. In these different collections the amount of casein (N. × 6.25) and fat were determined. These results, figured to the loss per 1,000 pounds of milk, are given in the following table. The per cent. of acid with phenolphthalein as an indicator, was determined at milling and in the two separate curds at salting:

Loss per 1,000 Pounds of Milk.

Date of making.	Unwashed.	Washed.	Loss before salting. (grams)*		Loss after salting. (grams)		Total loss of casein and fat. (grams)	Loss due to washing. (grams)	Acid per cent.	
			Casein.	Fat.	Casein.	Fat.			At milling	At salting.
Sept. 26	"	....	22.31	56.7	73.81	47.20	200.02	....	1.017	1.259
" 26	......	"	117.50	295.1	52.75	27.24	492.59	292.57	1.017	1.062
Oct. 4	"	......	16 00	25.3	60.75	58.50	160.55	....	1.062	1.323
" 4	.....	"	lost.	225 0	50.60	28 00	....	....	1.062	1.107
" 19	"	.....	4.44	2.02	48.70	39.40	94.56	....	.918	1.107
" 19	......	"	70.60	170.40	44 06	36.00	321 06	226.5	.918	.936
" 26	"	......	6.50	17.30	99.40	71.40	194 6	... .	.936	1.260
" 26	......	.... .	65.00	313.70	49.20	55.10	483 0	288.4	.936	1.050

A study of the table shows clearly that before salting the greater loss, both of casein and fat, was sustained by the washed curd; but, after salting, the greater loss was with that which had not been washed. Taking the total loss, however, of these two substances, with the two different methods of treatment, we always find a greater loss where the curd has been washed.

The effect of washing upon the acid is very noticeable. In no case is the per cent. of acid at salting in the drippings from the washed curds as high as in that from the unwashed. In fact, it is very little higher than at milling. It is doubtful, however, if the acid in the inside of the cubes of curds is affected much; for the amount of acid in the cheese when taken from the press, measured by phenolphthalein indicator, has been practically the same wherever we have determined it.

From the results of Prof. Dean's work in determining the effect of washing, and from the above, there appears to be very little doubt that when curds are tainted, or have developed too much acid, washing is beneficial; but that it is done at the expense of a slight loss in yield of cheese.

Sugar Beets.

The investigations regarding the suitability of parts of Ontario for the production of beets for the manufacture of sugar, have been continued this year. Besides analyzing

* 453 grams equal to one pound.

the beets from the various experimental points throughout the Province, the results of which Dr. Shuttleworth is reporting, we have analysed over 100 odd samples. Some of these gave high per cents. of sugar; others, evidently from poor seed and poor cultivation, gave very poor readings.

The following results are given to illustrate the wide variation in the quality of these beets :

	Average weight of Tared Beets.		Per cent. of sugar in Beets.	Purity.
	lbs.	ozs.		
1	3	2.7	8.9	74.6
2	1	3.2	9.7	79.2
3		13.8	9.6	73.2
4	1	5.9	16.8	88.5
5	1	2 7	16.6	89.8
6	1	4.5	16.9	86.8

Although much interest is manifested in the sugar beet question, it is very evident from the samples sent in for analysis and from the questions asked, that growers have a great deal yet to learn regarding the importance of good seed and proper cultivation.

In a Province like Ontario, where agriculture is the leading industry, if the agriculturist prospers, the influence of that prosperity is felt throughout all the trades and professions. Because of this fact, the capitalist, the merchant, and the farmer are all interested in the sugar beet question, which is arousing so much interest throughout the country. If we may judge by the prosperous condition of the farmers and others, directly and indirectly affected in the districts in which this industry has become established, it would be a boon to this Province. The growing of sugar beets for factory purposes would not crowd out the live stock and dairying industries which have done so much for our farmers, but would supplement these, in that a good food is obtained as a bye product, and it would tend to force unprofitable grain growing more and more into the background.

Almost any soil that will grow good turnips or mangels will produce the right quality of beets. When grown on heavy clay soils, there is a greater difficulty in getting the young plants through the ground, and more labor in all the after work; but the beets from such soil are usually of high quality. When we consider the amount of labor in volved in the cultivation and the quality in beets, we are forced to conclude that strong sandy or clay loams are likely to give the best results in beet growing.

While the best results are got from rich ground, coarse farm-yard manure should not be applied in the spring, nor any nitrogenous manure late in the growing season. As a special manure, possibly there is nothing better than wood-ashes. Sod plowed down in the spring is a poor preparation for this crop; for, like the coarse farm-yard manure, it tends to make the beets rooty and thus decrease the percentage of sugar.

The one great difference in growing sugar beets for cattle and for sugar factory purposes, is that in the former case they need not necessarily be mature, while in the latter, they must be as near maturity as it is possible to get them. As the beet matures, sugar accumulates in the root; consequently, the nearer the beet has reached to maturity when pulled, the higher is the percentage of sugar and the lower the percentage of solids not sugar; or, in other words, the purity is higher in well-matured roots. Both high per cent. of sugar and high purity are absolutely necessary in beets of good quality. This being true, it follows that everything that can possibly be done to hasten maturity should receive careful attention. It is for this reason that the method followed in the cultivation of roots for food purposes is departed from; and, instead, the rows are grown as closely together as it is possible to cultivate them (18 to 21 inches), and thinned to not more than 7 or 8 inches in the row. It has been said that the ideal way to grow sugar beets is in rows 10 inches apart and thinned to 10 inches in the row, thus leaving the

plants 10 inches apart each way. This method, however, would entail hand cultivation entirely. To allow as much as possible the use of horses in the work, the rows are placed a little farther apart and the beets thinned to less than 10 inches in the row, say 7 or 8 inches. The advantage of crowding them is that, being closer together, they are sooner forced to maturity.

Another essential in growing beets for sugar purposes, is that they be grown well in the ground. Nothing but the crown carrying the leaves should appear above the surface. This result is obtained by crowding the beets together. An illustration of the effect of crowding may be seen in any patch of beets, by observing the difference between the outside rows, or where blanks occur in the row and where the rows are full. That part of the beet which is above ground contains less sugar, and, besides, certain substances are present in it which decrease the amount of sugar that can be recovered from the beet; consequently, the factory men object strongly to any style of cultivation which tends to produce roots of this description.

The bright sunshine and dry weather of this fall have been very favorable for the growth of beets of the highest quality. Hence even the large beets, which, with ordinary fall weather, would be very low in sugar, are giving splendid results. If I mistake not, roots of all kinds are better for feed this winter than usual; for, while fodders deteriorate for feeding purposes as they mature, roots improve.

All that need be said here regarding the cultivation after thinning, is that possibly no crop responds so freely to thorough cultivation as do sugar beets.

The variety of seed used is a very important point; for, just as the best milking cows are the result of judicious selection, so the ability to produce a large amount of sugar of a high purity has been bred into certain varieties of sugar beets. In another part of this report, the results of the analysis of some 25 varieties of sugar beets grown in the experimental plots at the College are given. All these varieties had equal chances, but those in which the sugar producing tendency had been specially bred, contain, in some cases, nearly twice as much sugar as others. For yields per acre of these different varieties, see the report of the Experimentalist.

Those best informed and most interested in the growing of sugar beets, have long felt that beets of a very high quality could be grown in Ontario. Previous to the season of 1900, practically no united effort was made by any section of country to prove that beets of the right quality could be grown. An exception should possibly be made of the Owen Sound district, for there beets were grown more or less in the proper way and with the object of attracting capital to establish a factory. An analysis of some 40 lots from this section was made in 1898 and gave fair results, the best up to that time. Other than these, the beets sent were a very uneven lot, all grown from inferior seed and in the same manner as they would be for cattle food. In the the spring of 1900, a small sum of money was voted by the Legislature for the purpose of having thorough and reliable tests made of a few sections of the Province. Aylmer, Welland, and Newmarket were the districts selected for the first tests. About fifty experimenters in each district, whose plots had been inspected and approved, were supplied with seed and full directions regarding methods of cultivation. To encourage thoroughness and close adherence to rules in cultivation, prizes were offered. Inspections were made from time to time during the summer and marks awarded for cultivation as well as for the per cent. of sugar and yield of beets. The following were the results obtained from the last analysis of the season at the three experimental points.

	Per Cent. Sugar.	Purity.
Alymer	13 9	86 8
Welland	14 4	84 9
Newmarket	15.–	84.1

Last spring fifteen different districts made application to the Government for a thorough test to be made of the suitability of their soil for the production of beets for sugar purposes. Because of the increased number of sections to be tested, it was found advisable to decrease the number of experimenters in each place to 25. The plan of the experiment was similar to that of the year before, but where prizes were offered they were contributed by the municipality in which the test was made.

The following are the results of the various experiments :

	Per Cent. Sugar.	Purity.	Yield per Acre.	
			Tons.	Lbs.
Alvinston	15.19	86.1	21	876
Belleville	15.7	88.8	16	1,725
Clinton	14.8	86.7	16	662
Cayuga	16.2	88.2	14	1,665
Dunnville	15.13	88.15	15	523
Lindsay	16.4	83.7	15	131
London	15 6	88 1	17	59
Mount Forest	15.6	86.7	19	500
Port Perry	16.6	89.3	15	156
Peterboro'	17 3	90.6	16	180
Walkerton	15.4	88.0	18	1,701
Whitby	15.8	89.1	22	83
Berlin	14.6	85.8	18	1,398
Waterford	15.3	86 5	17	317
Simcoe	14.5	86.6	14	610
Average	15.61	87.49	17	495

The cost of producing an acre of beets, as estimated from the actual figures reported by last year's experimenters, was $26 per acre. This includes rent of land, seed, cultivation, etc., but not hauling to the factory.

Under the Act passed by the Legislature last session, the farmer will be paid $4 a ton for all sugar beets delivered during the first year in which the bounty will operate. On this basis, the gross income at Whitby would be over $88 ; and if the cost of cultivation, etc., (say $26) is deducted, there will be a net profit of about $60 per acre. The lowest average reported in the experiments was at Simcoe, 14 tons 610 pounds to the acre ; but, even with that yield, the profit would be above $30 to the acre. Furthermore, according to the Act, during the second and third years of the bounty, the factories must pay 33⅓ cents per ton for every 1 per cent. of sugar over 12. On this basis, the Peterboro' experimenters would receive $5.76 per ton, and the Simcoe farmers, whose average of sugar was the lowest this year, would receive $4 83 per ton, instead of $4, which would increase the profits very materially.

Colorado is considered the best State in the Union for the production of sugar beets of high quality. The following table and quotation is taken from the Colorado State Agricultural College Bulletin, No. 51, on "Sugar Beets in Colorado in 1898." The table gives the average results of a number of analysis in ten different counties :

Average results by Counties.

County.	Gross weight of trimmed beets per acre.	Sugar in beet.	Purity.	Factory value per acre.
	Tons.			$ c.
Conejos	19.53	15.67	80.0	79 11
Costilla	14 05	15.42	84 3	56 92
Delta	22.54	14.74	80 0	86 23
Fremont	23 36	16.87	84.1	99 75
Garfield	18 96	16.12	84 8	76 98
Larimer	25.32	15 52	80.2	102 56
Logan	17.80	14.09	77 3	64 00
Mesa	20.90	15.22	77.9	79 90
Otero	22.59	15 14	79.8	86 40
Weld	13.98	15.89	79.8	56 70
Average	19.90	15.47	80..8	76 07

" In considering the foregoing table, one is struck at once with the high average excellence of the sugar beets in Colorado as regards both quantity and quality. In the districts of the United States where beets are raised for factories, 12 per cent. of sugar

and 78 purity are considered standards, and one who has raised 10 to 13 tons of beets to the acre is thought to have done well. A fair estimate of the cost of raising sugar beets is $30 per acre, while the above table gives $76.07 as the average factory value for the whole state. The difference of $46.07 profit per acre will compare well with any other kind of farming practised in Colorado, not even excepting the famed cantaloupes of the Arkansas valley, the orchards of the western slope, or the lambs of the northern feeding districts."

It is evident, from a consideration of the above, that if Colorado is an exceptionally fine state for the production of sugar beets of a high quality, Ontario may also be classed as a good sugar beet producing country. As has been stated, this fall has been a very favorable one for maturing beets, and this year's results are higher than they will be with average years; but we must also remember that these are only experimental results and not what can be done when land is specially prepared and the cultivation better understood.

Of course, these experiments are not conclusive proof that a great beet sugar industry will be developed in this Province; but they show that, with careful attention and a continuity of purpose on the part of the farmers, they should be at least a very profitable crop.

In conclusion I wish gratefully to acknowledge the hearty co operation of the Dairy and Bacteriological Departments in all the work in which we have been associated during the year.

Respectfully submitted,

R. HARCOURT,

Professor of Chemistry.

PART VI.

REPORT OF THE PROFESSOR OF VETERINARY SCIENCE.

To the President of the Ontario Agricultural College :

Sir,—Allow me to submit my report for 1901.

Class Room.

The class room work was much the same as usual, except that I endeavored to make the course more practical, and did not take up as much time as usual with the study of anatomy.

First Year Lectures and demonstrations to the first year consisted in a course on the anatomy of domesticated animals, especially that of the horse, noting points where essential differences exist between his anatomy and that of the other classes of stock. This course included a brief study of the skeleton, joints, muscles; digestive, respiratory, urinary, and generative organs; also the circulatory and absorbent systems, the eye, skin, and foot. I also gave a course of lectures on the building of stables, the location, material used, size and arrangement of stalls, both open and box, ventilation, drainage, etc.; likewise the general care of horses, as regards feeding, watering, grooming, exercising, etc, and the care of saddlery, harness, and carriages. In addition to the above, I gave a course of lectures on judging horses. In this work we labor at a disadvantage in not having the different breeds and classes well represented. I select, for demonstrations, the best we have, borrow some and supply some from my own stable. During the winter term, I delivered

to this class a course of lectures on Veterinary Materia Medica, in which I spoke of the general action of the medicines and the different modes of administration and application, with the advantages and disadvantages of each. We considered individually the properties, actions, uses and doses of the drugs commonly used for the prevention and cure of the ordinary diseases to which farm stock is subject.

Second Year. The class-room work for this year consisted in the consideration of the causes, symptoms, and treatment (both preventive and curative) of the ordinary diseases of farm stock, with frequent reference to the proper mode of feeding, watering and general care of stock, in order to prevent disease. During lectures, I usually have one of my own horses in the class-room and explain the different appearances of a diseased and a healthy animal; and in speaking of the diseases of the bones, joints, muscles, feet, skin, etc., I point out on the healthy animal the seat of disease and explain the change in appearance produced. I also have specimens of diseased bones, and am thereby able to show the class the change of structure that takes place. I gave a course of lectures on Veterinary Obstetrics, speaking of the general care of females during pregnancy and after parturition, noting the diseases of both dam and offspring, incident to the parturient state, and giving special attention to the care of the young. As far as possible I illustrate these lectures with charts. A course of lectures called "Practical Horse" was also given, in which I demonstrated with a living horse the best methods of securing an animal for minor operations, such as opening abscesses, dissecting out tumors, dressing and stitching wounds, and firing for spavin, ringbone, and kindred diseases; the different methods of castration, etc. I illustrated the methods of administering medicines, dressing teeth, scarifying lampas, etc., passing a probang into an ox, and puncturing an ox in case of excessive bloating, etc. In addition to the above, I gave instructions in judging horses, using those we have on the farm and in my own stable, borrowing some and taking the classes to the farms and stables of local breeders.

Third Year To this class, I gave lectures on the different breeds of horses and upon judging horses. To the special dairy class, I gave a short course on the causes, symptoms, and treatment of the ordinary diseases to which dairy stock is subject.

Diseases and Ailments of the Stock.

Besides class room and practical work, I gave professional attention to all the stock belonging to the institution, and am pleased to be able to state that the losses were few. Below will be seen particulars.

Horses. We had several cases of colic, acute indigestion, influenza, lymphangitis, sore necks and shoulders, calks, bruises, wounds, eczema, lameness. &c., all of which recovered.

Cattle. We had three cases of parturient apoplexy in cows, one of which was fatal, several cases of retention of the placenta, inflammation of the udder, sore teats, obstruction of the milk ducts, indigestion, impaction of the rumen, impaction of the third stomach, etc We had also a few cases of difficult parturition, several cases of uterine discharge following parturition (and in one or two instances abortion), which I treated successfully by administering carbolic acid in from 20 to 30 drop doses three times daily. We had some diarrhoea in calves, and lost one in the dairy herd from this cause. With the exception of the fatal cases mentioned, all the above made good recoveries.

Sheep The only losses we had in sheep were two or three lambs from wool balls in the stomach, and one ewe from inflammation of the womb.

Pigs. We had little trouble with the pigs and lost none, except a few newly born ones.

I have, Sir, the honor to be

Your obedient servant,

J. H. REED,
Professor of Veterinary Science.

PART VII.

REPORT OF THE PROFESSOR OF DAIRYING.

To the President of the Ontario Agricultural College :

SIR,—This eleventh annual report of the department of Dairying will deal with the Dairy School, dairying as taught to the College classes, experimental work relating to cheese and butter making, and miscellaneous notes relating to the dairy herd, improvements, milk supply, etc.

There were two sessions of the Dairy School in 1901. The regular course commenced January 2nd, and closed March 22nd. The Creamery course began December 2nd and will close December 21st. For all courses there were registered 80 students. Of these 65 students registered for the factory and farm dairy courses from January to March. The attendance at the special class for creamery buttermakers was fifteen. During the year, fourteen ladies took dairy work, of whom two passed all the examinations for the factory course. The remainder took the farm dairy and creamery course, of whom seven passed the final examinations in the farm dairy. Altogether there were 31 who registered for the farm dairy and special work. For the full factory course, 34 registered.

In addition to the regular work done in other years, practical work in Dairy Chemistry and Dairy Bacteriology was added. The branch proved very interesting and helpful to the classes. These two sciences require more emphasis in all dairy training. Our dairy classes yet need more practical instruction in the handling of boilers and engines, placing of shafting, pulleys, belting, etc. Our milk supply has also been inadequate for thorough practical instruction in the manufacture of butter and cheese. We expect a larger supply for the coming year. During the creamery course in December, one of the churns was used for churning the cream delivered by the patrons who separate their cream on the farm, usually with a hand separator. The cream is measured and tested according to the rules adopted by cream-gathering creameries in the Province. While it is not nearly so convenient a method as the Babcock test, we have adopted the "oil test," because nearly all the cream-gathering creameries use this method of dividing proceeds among their patrons. Students who operate such creameries will thus be given practical training along the lines they will meet with in operating cream gathering creameries.

Forty one students wrote on the final examinations in March, which is the largest proportion of registered students we have ever had While the attendance is not so large as it was a few years ago, our students remain with us for a longer time, and we are able to do more for them. The value of the work done by a Dairy School cannot be measured wholly by the number of students in attendance.

For 1902, we have added a special course of demonstrated lectures in Home Economics, or what is commomly known as Domestic Science. This promises to be a very interesting and helpful branch of the Dairy School, especially for ladies. Any system of agricultural and dairy education which neglects, or overlooks, the training of good home-makers is deficient.

Those applying for diplomas in 1901, are: Peter Callan, Drumbo, Ont. (cheese); Thos. F. Boyes, Lambeth, Ont. (cheese); J. R. Hutchison, B. S. A, St. George Ont. (cheese); G. J. Immel, Grafton, Ont (cheese); Wm. McKay, Courtice, Ont. (cheese); J. R. Nesbitt, Shoal Lake. Man. (butter); A. J. Wagg, B. S. A., (butter) ; W. E. Witt, Moosomin N. W. (butter).

The first year students of the college are given a full course of lectures relating to the dairy cow,—her breeding, feeding, care and management, in order to get the best results; the care of milk for cheese factory and creamery ; town and city milk and cream trade; testing milk with the Babcock milk-test and lactometer ; the creaming of milk by gravity and centrifugal methods ; the ripening of cream ; churning, salting, working, and preparing dairy butter for market ; and the judging of butter. In addition to the lectures, all first year students work one afternoon each week during October and November, in the Farm dairy,—testing milk, running cream separators, setting and skimming milk, ripening cream, churning and preparing butter for market according to the most approved

methods. So far as we know, the first year students who take this work are not lacking in opportunity to know all that there is to be known about the science and practice of dairying on the farm. The time for practical work in the afternoons could doubtless be extended with profit, if the college course permitted an extension.

The second year class receive a course of lectures on co operative dairying, including all phases of factory butter and cheesemaking. The construction of dairy buildings; dairy machinery; formation of joint-stock companies; manufacture of condensed milk; judging and marketing of butter and cheese; value of dairy by-products (skim-milk, buttermilk, whey), etc.; all these are fully dealt with.

The practical work of the second year includes the special creamery course, and some work in cheesemaking. There is not so much practical work as there ought to be for the second year.

Specialists in dairying of the final year study two text-books, and spend as much time as possible in practical work in the Farm dairy, College creamery, and cheese factory. More time should be given to scientific investigations along practical lines in the final year of students who are specializing in dairying.

EXPERIMENTS IN CHEESEMAKING.

Care of Milk for Cheesemaking.

The importance of this question, and the great diversity of opinion as to the best methods of caring for milk, is our reason for continuing this work year after year. We hope to continue it until we have more exact data. Each year brings new conditions of atmosphere, new cows, new methods, and new men; hence, it is only after a number of years' experiments that we can hope to reach definite conclusions on this important part of cheesemaking.

The experiments of the last year were made chiefly in the month of August, and with milk from our own herd. There were two groups of experiments. In No. 1, half of the night's milk was cooled to a temperature between 60 and 70 degrees, with as little stirring as possible. The other half was aërated and cooled, but not to so low a temperature as the unaërated. It was found that aërating without cooling was not satisfactory, as the milk was over-ripe the following morning. In the aërated lots, the morning's milk was also aërated before mixing with the night's milk. In No. 2, one-half of the night's milk was stirred and cooled to about 50 degrees, and from three-quarters to one per cent. of culture was added after the milk was cooled. The other half was cooled to about the same temperature, viz., 50 degrees, but no culture was added to it.

The quantity of milk used in each lot was about 300 pounds, testing from 3.5 to 3.6 per cent. fat. The average minimum temperature of the night air during the experiments was 53.6 degrees. The average morning temperature of the aërated lots of milk in Group 1 was 67.5 degrees, and of the unaërated was 64 degrees. The average degree of ripeness, as measured with the dram rennet test, was 25 seconds for the aërated milk, and 27.6 seconds for the unaërated. In other words, the unaërated and cooled night's milk was sweeter the following morning. The yield of cheese was slightly greater from the lots unaërated, while the loss of weight in curing was 4.90, and 4.86 per cent. respectively for the aërated and unaërated lots.

The average score for flavor was 34 out of 40 for the cheese made from the aërated milk. The average score of the unaërated lots was 34.33. The total average score was 88.11 for the aërated lots, and 88.44 for the unaërated. The results are similar to those obtained in previous years.

In Group 2, where the milk was cooled to 50 degrees and culture added at night, the average rennet test the following morning was 29.2 seconds. The average rennet test of lots cooled to 50 degrees, but to which no culture was added, was 37.2; in other words, the latter was much sweeter.

The yield of cheese was about two per cent. greater from the lots cooled without the addition of culture at night, and the cheese from these lost about .3 per cent. less while curing. Both lots scored an average of 35 for flavor. The average total score was 89.5 for the lots which were cooled to 50 degrees, and to which culture was added at night, and the score was 90 where cooling to 50 degrees without culture was practised.

Conclusions :

1. Aëration of milk without cooling below 70 degrees is not sufficient to prevent milk from becoming overripe during the night in hot weather.

2. Cooling night's milk to a temperature below 70 degrees is necessary in order to have the milk reach the cheese factory in a condition suitable for the manufacture of good cheese.

3. Cooling to 50 degrees and the addition of a culture to control flavor has not yet proved entirely satisfactory.

VARIATIONS IN METHODS OF MAKING CHEDDAR CHEESE.

To determine what effects on yield and quality of cheese would be produced if lower setting and cooking temperatures, combined with an extra quantity of rennet, were adopted, twelve experiments were made during May and July. From 600 to 1,500 pounds of milk, testing an average of 3.46 per cent. fat, were thoroughly mixed in a vat. The milk was then equally divided between two vats. One vat was heated in the ordinary way by the addition of $3\frac{1}{3}$ ounces of rennet for 1,000 pounds milk, added at a temperature of 86 degrees and the curd cooked to 98 degrees. To the other vat was added rennet at the rate of 5 ounces per 1,000 pounds milk, at a temperature of 82 degrees, and the curd was cooked to 94 degrees instead of 98 degrees.

Results :

1. Both vats coagulated in about the same length of time, and both were about the same time in developing sufficient acidity for removal of whey.

2. The vat of milk set and cooked at the lower temperatures had about the same per cent. of acidity when dipped, but at milling and at salting it contained considerably more acid than the normal vat—.756 and .993 as compared with .709 and .951. This extra acidity was apparently in the cheese, as most of the cheese made by setting and cooking at the lower temperatures showed too much acid when cured and were "short" in the texture.

3. The gain in yield of cheese was a little over one pound per 1,000 lbs. milk by setting and cooking at the lower temperatures. In curing, the normal curd lost 4.62 per cent. and the others lost 4.74 per cent.

4. The cheese made in the usual way scored higher in flavor, color, and texture. The average total score was 89.5 for the normal cheese, and for those made with extra rennet and lower temperatures it was 88. On July 23, two cheese were made according to these methods, and placed in cold storage. Both were fine cheese when scored on October 24th, and there was a gain in weight of $\frac{3}{4}$ lb. cured cheese, from 600 lbs. milk by using more rennet and adopting a lower temperature for setting and cooking.

Conclusions : The use of an extra amount of rennet and the adoption of lower temperatures than is customary for renneting and cooking gave an increased yield of cheese, but as cured in an ordinary curing room it developed too much acid, and the quality was inferior. In the one trial where cheese were cured in cold storage, the quality of the cheese was equally good, and there was a gain in the amount of cheese produced equal to about one and a quarter pounds per 1,000 lbs. milk. This is no small item in a factory handling 20,000 to 30,000 lbs. of milk daily. The matter is of sufficient importance to warrant further investigation.

WASHING CURDS.

Some twenty experiments were made in July and August, which were a continuation of those conducted last year. Twenty thousand pounds of milk, testing an average of 3.51 per cent. fat, were used. The quantity of milk used in each experiment was from 800 to 1200 pounds. In September and October, some further experiments were made, more especially to see the difference in loss of soluble matter by washing. These latter experiments will be reported upon by the College chemist, as they were made under his direction.

The experiments were made in three series In Series I, the curds were equally divided after milling, and one half of the curd was washed with a quantity of water equal to

the weight of the curd and at a temperature of 98 degrees. The curds not washed produced 423.75 pounds green cheese and 407.5 pounds cured cheese. They lost 3.83 per cent. in four weeks, while curing. The washed curds produced 419 75 pounds green cheese and 403 pounds cured cheese. They lost 3.99 per cent. in curing.

In Series II. the curds were equally divided after milling, and one lot was washed with a quantity of water at 98 degrees, equal to twice the weight of the curd. The other half was unwashed. The yield of green cheese from the unwashed lots was 492 5 pounds, and from the washed lots the yield was 488 pounds. The cured cheese was 475.5 and 470.5 pounds respectively. The lots unwashed lost 3.45 per cent. in curing, and washed lots lost 3.58 per cent. in curing.

Series III. consisted of four experiments, in which a vat of milk containing 1,200 pounds was thoroughly mixed. It was then divided into two equal parts and both were handled exactly alike, so far as possible. The 2,400 pounds milk, the curds from which were unwashed, produced 215 75 pounds green cheese and 209 pounds cured cheese. The curds from the same quantity of milk washed with twice their weight of water at 98°, produced 224 pounds green cheese and 206 75 pounds cured cheese.

These cheese were scored by Messrs. Bell, Muir & Steinhoff on September 21st. The table shows the average of the three judges' scorings:

Table showing the score of the cheese made from unwashed and washed curds.

Kind of Cheese.	Av. Flavor (Max. 40)	Av. Closeness (Max. 15)	Av. Color (Max. 15)	Av. Texture (Max. 20)	Av. Total (Max. 100)
Series I.					
Unwashed	32.24	13.87	13.80	15.59	85.48
Washed with an equal quantity of water at 98°	32.22	13.90	13.85	16.03	86.
Series II and III.					
Unwashed	31.34	13 80	13.62	14.95	83.71
Washed with twice the weight of water at 98 degrees	30.71	13.71	13.75	15.00	83.17

Conclusions:

1. Washing curds in the experiments of 1900 and in 1901 caused a lessening of the yield of cheese. The loss during the past year was equal to about one pound cured cheese per 100 pounds curd.
2. In the four trials where milk was equally divided, the loss of cured cheese was 2.25 pounds for 2400 lbs. milk.
3 The average score of the cheese in Series I was .52 of a point higher from the washed lots, and in Series II and III, the unwashed lots scored an average of .54 of a point higher, so that we may conclude there was little difference in the quality of the cheese.
4. The practice of washing curds should be the *exception* and not the rule, as it wastes cheese producing material.

Light vs. Dark Curing-Room.

During May and June, 16 experiments were made to determine the effects of light and darkness in curing cheese. From 600 to 800 lbs. milk, containing an average of 3.46 per cent. fat, was made into cheese according to our usual methods. After salting, the curds were evenly divided and put into two hoops. When taken from the press, one was put into a well lighted room, and the other was placed in a dark room. As far as possible a uniform temperature and moisture content were maintained in both rooms. The

average temperature of the dark room was 66 degrees and the average per cent. of moisture was 76.4. The average temperature of the light room was 64.6°, and of moisture 79.3. Both rooms were ventilated and cooled by means of a sub earth duct. The cheese moulded about the same in both rooms, unless sprayed with formalin.

The cheese cured in the dark room lost 4.26 per cent. in weight during one month Those cured in the light room lost 4.23 per cent., practically the same. The average score in flavor was 36.16 in the light room and 36.26 in the dark room. In the other qualities, there was little or no difference. The total average score was 91.69 in the dark room, and 91.84 in the light room.

Conclusion: Under the conditions named in these experiments, there would seem to be little difference between the loss of weight in curing, and in the quality of the cheese, whether cured in a light or in a dark room, if temperature and moisture are about the same in both rooms. The amount of mould on the cheese was also about the same in both rooms.

Curing Cheese in Cold storage

A series of experiments were conducted during the past season to determine the effects of curing cheese in cold storage in different stages after being made, as compared with curing in an ordinary curing room kept at about 65 degrees. The plan of the experiment was as follows:

Fifteen hundred pounds of milk were made into five cheese. One of these cheese was put directly into cold-storage at a temperature of 40° when taken from the hoop. The other four were put into our ordinary curing room. At the end of one week, one of these cheese was placed in the cold-storage; at the end of two weeks, another was put in; and at the end of three weeks, another. The fifth cheese was cured in the ordinary way at a temperature of about 65 degree, as stated above.

The loss in shrinkage and the quality of the cheese were ascertained by the Dairy department. The bacterial content, and the chemical changes were studied by the Bacteriologist and the Chemist at the College.

The full details of the experiments will be published in bulletin form before the opening of another cheese season, as many of the cheese are not yet ready to be reported upon.

We may anticipate these results by saying that, so far as the work has gone, it indicates that cheese may be cured at a temperature of 40 degrees, in about three to four months' time, and that the quality of cheese cured in cold-storage is superior to that cured at ordinary temperatures. The results also indicate that the sooner the cheese are placed in cold-storage after being made, especially in hot weather, the better the quality of the cheese, and the less loss by shrinkage. Cold-storage for dairy products is evidently a very important factor in securing an improved quality of goods.

EXPERIMENTS IN BUTTERMAKING.

1. Butter Cultures.

It is unfortunate that our butter and cheese-makers have adopted the use of the word "starter" when speaking of that which is put into cream or milk to improve the flavor developed during ripening. A "starter" is something that starts the ripening of the cream; but that which we add to the milk or cream must do more than "start" ripening, or it will fail in its object. It must control, refine and improve the quality of the product. Hence we prefer the use of the term "culture" rather than "starter."

Three series of experiments were carried on during the year. The first related to the effects of different amounts of culture added to the cream for ripening purposes; the second was made to determine the relative value of propagations made from different pure cultures; and the third compared a pure culture made from pasturized skim-milk with one made from a mixture of whole milk, skim-milk and buttermilk.

In Series I., five, ten, fifteen, twenty and twenty-five per cent. of culture was added to the cream. The main points in the experiment are shown in the following table:

Per cent. culture added to the cream.	Number of experiments.	Weight of milk	Av. per cent. fat in milk.	Av. per cent. fat in cream.	Per cent. acid in cream when churned.	Av. temp. For ripening.	Av. temp. For churning.	Average time churning.	Average time ripening.	Average score for flavor.	Average total score.
		Lbs.				°	°	Mins.	Hrs.	Max. 45	Max.100
Five	5	6,063	3.70	30.8	.592	63	47.8	42	15.6	42.2	97.2
Ten	5	6,641	3.72	32.2	.593	65	48	43	11.0	41.6	96.6
Fifteen	5	7,760	3.70	27 9	.610	68	48	45	9.5	42.0	97.0
Twenty	5	5,277	3 67	28.9	.583	67.4	47.8	37.7	8.0	41.2	96.2
Twenty-five	5	6,567	3.72	29.1	.582	68.4	48	39.0	5.3	41.2	96.2

In Series II. and III., cultures made from pure cultures obtained from the College Bacteriological Laboratory were compared with cultures from the C. Douglass Co., of Boston, Mass., from Conn's B. 41 Co., of Philadelphia, and with cultures made by mixing whole milk, skim-milk and butter-milk, using the O. A. C. pure culture for the ferment.

The main points are brought out in the following table of results:—

Kind of culture.	Number expts.	Pounds milk.	Av. per cent. fat in milk.	Av. per cent. fat in cream.	Av. per cent acid in culture	Av. per cent. acid in cream when churned	Av. per cent. culture used in cream.	Av. temperature for ripening.	Av. temperature for churning.	Average score for flavor.	Average total score.
								°	°	Max. 45	Max.100
{ O. A. C.	15	20,085	3 6	28.2	.759	.599	17.4	65 5	48	41.80	96.8
{ Douglas	15	19,463	3.6	28.0	.787	.602	16.3	66	48	41.06	96.0
{ O. A. C.	3	4,536	3.7	27.5	......	.580	15.0	70	52	40.6	95.6
{ B. 41	3	4,536	3.7	27.5	......	.598	15.0	70	52	41.3	96.3
{ O. A. C.	6	7,047	3.57	27.5	.....	.567	14.1	66.6	49	40.8	95.8
{ Mixed culture	6	7,047	3.57	27.5	.....	.567	14.1	66.6	49	40.8	95.8

Summary:

1. To ripen the cream with five per cent. of culture required fifteen hours, whereas twenty-five per cent. culture ripened the cream in about five hours.

2. The highest average score for flavor in the butter was obtained by ripening at a lower temperature, with a small per cent. of culture, and taking a longer time to ripen the cream.

3. Comparing O. A. C. and Douglass cultures, there was very little difference in the results. The average score for flavor of the butter was slightly higher in those lots made by using the O. A. C. culture.

4. The "B. 41" culture gave a slightly higher score for flavor than did the lots made by using the O. A. C. culture, though the scores were not quite so high as in the previous series.

5. A culture made by using the O. A. C. pure culture in equal quantities of whole milk, skim-milk and butter-milk did not give any better results than the use of this culture in pasteurized skim-milk, which is our usual method of preparing a culture.

2. Moisture and Salt in Butter.

Considerable interest is now being taken in the question of the moisture and salt content of butter. From April to August, a series of experiments were made to ascertain the effects of different methods of treating butter on the amounts of moisture and salt retained by it.

The points investigated related to: temperature in churning; size of butter granules; temperature of washing water; washing once and twice; salting at rates of one ounce, three-quarters ounce, one-half ounce, and no salt; working once, twice, and three times; and the effects of pasteurization at different temperatures compared with non-pasteurizing.

The samples of butter were taken immediately after the final working. From three to four grams of butter were placed in a shallow tin dish and dried for from eight to ten hours, or to a constant weight, in a drying oven. The salt was determined with a standard silver nitrate solution in which one c.c. of the silver nitrate was equivalent to .005 gram of sodium chloride.

The method of adding one to one and a half c.c. of alcohol to the samples, as recommended by Richmond, and weighing at the end of two hours did not prove satisfactory.

Results of Experiments in Amounts of Moisture and Salt in Butter.

Kind of Butter.	Average per cent. of Moisture.	Average per cent. of Salt.
Butter churned at 44°–48°	13.678	2.24
" " 54°–58°	13.5[illegible]8	2.34
Butter in fine grains	12.933	1.72
" size of wheat grains	13.223	2.39
" " corn "	14.207	2.93
" in lumps	12.542	2.56
" washed with water at 40°–48°	13.0[illegible]2	2.23
" " " " 50°–60°	13.289	2.35
" " once	12.648	2.00
" " twice	12.513	1.81
" salted one ounce to pound	13.470	3.43
" " one-half ounce to pound	13.141	2.52
" " three-quarter ounce to pound	14.058	2.60
" without any salt	12.940	....
" worked once	12.410	2.59
" " twice	12.666	2.21
" " three times	10.740	2.10
" from milk unpasteurized	13.690	2.15
" " pasteurized at 140°	13.128	2.57
" " " 160°	13.224	2.85
" " " 185°	13.994	2.55
" " " 195°	13.561	2.62

Summary:

1. There was very little difference in the average moisture and salt content of butters churned at temperatures between 44 and 58 degrees.

2. Butter churned into lumps had the lowest moisture content, and that in fine grains the lowest salt content. The lots churned into the size of corn grains had both the highest moisture and highest salt content of any in the series.

3. The moisture and salt content was about the same when washed with water at temperatures between 40 and 60 degrees. The same is true of samples washed once and twice, other conditions being equal.

4. Butters unsalted contained the least moisture and those salted at the rate of three-quarters of an ounce per pound of butter contained the most moisture. The salt content of the finished butter does not appear to have any constant relation to the amount of salt added to the butter. On the average, more than half the salt applied to the butter passed off in the working. In some determinations of the moisture pressed out by working, it was found to contain from 23 to 24.5 per cent salt.

5. We are unable to explain why the samples worked twice contained slightly more moisture than did similar lots worked once. Similar results were obtained last year. In both years the butter was given the same number of revolutions with the Simplex worker, whether worked once or twice, and both workings were given the same day, but about

three hours apart, *i. e.*, one half the amount of working was done, then the second half was done about three hours after the first. The third working reduced the moisture content nearly two per cent. This third working was made the day after the first two workings had been given.

6. The butters made from unpasteurized milk had a higher percentage of moisture than those made by pasteurizing at from 140 to 160 degeees, less than the lots pasteurized at 186 degrees, and about the same as those made by heating the milk to 195 degrees before separating.

3. Pasteurization of Milk at Different Temperatures.

A series of experiments, in continuation of those conducted in previous years, was carried on this past year, chiefly to determine the effects of different pasteurizing temperatures, between 140 and 200 degrees, on the bacterial content of milk, and upon the quality of the butter. A joint bulletin by the Dairy and Bacteriological departments has been published giving the results of these experiments.

Briefly, the results indicate that a temperature of 180 to 185 degrees is very favorable in reducing the bacterial content to a low point, and this temperature also adds keeping quality to the butter. If we wish to establish a good reputation for Canadian butter in the British markets, we shall have to adopt pasteurization; and if we wish our butter to retain its fine flavor for some time, we shall do well to pasteurize at a temperature of 180 to 185 degrees. In our experiments, the whole milk was pasteurized before separating and the skim-milk was run over a water-cooler before it was returned to the patrons. We found that this plan enabled us to send to the farmer a good quality of skim-milk for feeding purposes.

4. Miscellaneous.

Turnip Taint. In October turnip tops were fed to our cows along with "Virginia Cattle Food," to determine whether the addition of this "food" would destroy the turnip flavor. We did not have sufficient food to continue the experiment more than five or six days; but so far as we could judge, the milk was free from any taint of turnip. The butter, however had quite an objectionable flavor, though it was not "turnipy." This may have been due to the fact that the milk was not pasteurized, which is our usual custom.

Columbia Air Churn. Several tests of this churn were made during the year. Our general results were that the butter may be churned in the Columbia in less time than in a barrel churn, if the operator will exert himself sufficiently. Otherwise, there is no advantage as compared with the barrel churn. The tests of buttermilk for fat were usually higher from the Columbia, though there was little or no difference in the yield of butter. The quality of the butter was slightly inferior from the Columbia.

Testing Cows. Several "official tests" of pure-bred Holstein cows have been made under our supervision at the farms of owners. As several of the breeders of other cattle have established, or are about to establish, "official tests," it may be necessary in the near future to have some one permanently connected with the Dairy who can be relied upon to do this work. At present we secure the services of reliable graduates of the Dairy School, or College, to undertake the work.

Milk Supply for Experimental Work. We have had an average of about 3,000 lbs. milk daily for experimental purposes during the past season. This has enabled us to do more and better work. A number of farmers in the neighborhood were induced to supply us with milk, by our guaranteeing them 20 cents per lb. fat in the milk for the season, if they sent the entire season. Most of those who commenced and have continued the whole season are pleased with the results. We are aiming at a supply of 5 000 lbs. daily throughout the year for the Dairy School, and for the experimental work in the Dairy.

We adopted the plan of sending a circular letter monthly to each patron, enclosing it with his statement showing the pounds of milk delivered and the amount of money due him. The following are copies of the letters sent for the months of July, August, and September:

TO THE PATRONS OF THE COLLEGE DAIRY.

The amount of milk delivered by you now has dropped to about one-half what it was in the month of June. This indicates that your cows are not being fed so liberally as they were last month. Cows worried

with flies will not milk so well. We urge upon you the importance of keeping up the flow as much as possible for the next month, as we shall pay you *21 cents per pound of fat in August.* Therefore it is in your interests to send as much milk as possible.

Do not forget to strain the milk immediately after milking. Then set the can of milk in cold water and stir the night's milk until it is cooled below seventy degrees. If you will send us sweet, clean milk, we shall be able to return you skim-milk in good condition. We shall be glad to have you report the fact if the skim-milk does not reach you sweet. The cans of the skim-milk should be set immediately in cold water on their return to the farm. Sweet skim-milk is worth 15 to 20 cents per 100 lbs. for feeding young stock. Sour skim-milk is worth as much for feeding the grown pigs you are fattening.

Tests and Values per 100 lbs. for July, 1901.

Names of patrons.	% fat.	Cents.	Names of patrons.	% fat.	Cents.
Dairy Herd	3.5	70	Mr. Hamilton	3.5	70
Mr. Hesketh	3.6	72	" Dickson	3.7	74
Farm Herd	3.4	68	" Gordon	3.6	72
Mr. Tolton	3.4	68	" Atkinson	3.7	74
" Byrne	3.4	68	" Phillips	3.5	70
" Graham	3.5	70	" Jefferson	3.7	74
" Thompson	3.6	72	" Lamb	3.5	70
" McDougall	4.4	88	" Starkey	5.8	106
" Clair	4.0	80	" W. J. Laing	3.4	68
" Moore	3.6	72	" Peter Laing	3.5	70
" Lewis	3.5	70	Miss R. Laing	3.7	74
" Walsh	3.3	66	Mr. Roberts	3.5	70
" McNulty	3.6	72	" Hume	3.6	72
" Hanlan	3.6	72	Miss A. Lamb	3.5	70

O. C. A., July 31st, 1901.

TO THE PATRONS OF THE O. A. COLLEGE DAIRY.

We are much pleased with the *quantity* of milk sent in by you during the past month. The results show care on your part to maintain the flow of milk. A little more attention to the *quality* of the milk would enable us to make better butter and cheese and would prevent us from returning your milk. We do not like to return any milk to patrons. It hurts us more than it does them. A considerable portion of the milk has been over-ripe and bad-flavored at times during the past month. Be careful with the food given to the cows. Keep everything clean where the milk stands at night. Cool the milk at night. If you will do your part, we shall try to do ours to make dairying profitable to you.

As the butter and cheese markets are dull, we shall not be able to pay more than the guaranteed season's price of *20 cents per pound of fat for September.*

Do not forget that we shall take all the milk you can supply us during the winter. We want 5,000 lbs. daily from December to March, for which we shall pay 25c. per lb. fat delivered.

Test and Value per 100 lbs. Milk.

Names of patrons.	% fat.	Cents.	Names of patrons.	% fat.	Cents.
Dairy Herd	3.7	77.7	Mr. Hanlan	3.7	77.7
Farm Herd	3.4	71.4	" Hamilton	3.5	73.5
Mr. Daniels	4.0	84.0	" Dickson	3.7	77.7
" Arkell	3.2	67.2	" Gordon	3.6	75.6
" Heskett	3.5	73.5	" Atkinson	3.6	75.6
" Tolton	3.5	73.5	" Phillips	3.5	73.5
" Byrne	3.4	71.4	" Lamb	3.5	73.5
" Graham	3.5	73.5	" Starkey	6.0	126.0
" McDougall	4.5	94.5	" W. J. Laing	3.4	71.4
" Clair	4.0	84.0	" Peter Laing	3.7	77.7
" Moore	3.4	71.4	Miss R. Laing	3.8	79.8
" Lewis	3.4	71.4	Mr. Roberts	3.7	77.7
" Walsh	3.4	71.4	" Hume	3.6	75.6
" McNulty	3.8	79.8	Miss A. Lamb	3.7	77.7

O. C. A., August 31st, 1901.

TO THE PATRONS OF THE COLLEGE DAIRY.

The past month of September has been an excellent one for the cheap production of milk. We are pleased with the supply you have sent us, and hope that during the coming month of October, you will maintain the present supply.

This can be done only by careful feeding, stabling the cows on cold nights, and adding a fresh cow or two to the herd. Do not expect the cows which have been milking the whole summer to give as much milk now as they did earlier in the season. It is a wise plan to allow the cows to go dry for six weeks to two months before parturition. Cows which will calve in November and December should be dry this month.

A few mangels night and morning are excellent for keeping up the flow of milk in October and November. Please do not feed Swede turnips or turnip tops. Stand by the cow and your creamery and they will stand by you! Both the cow and the creamery are aiming to make it *pay* you to keep cows.

The following are the tests and values per 100 lbs. for September :

Names of patrons.	% fat.	Cents.	Names of patrons.	% fat.	Cents.
Dairy Herd	3 6	72	Mr. Hamilton	3.9	78
Farm Herd	3.3	66	" Dickson	4.0	80
Mr. Daniels	4.2	84	" Gordon	3.7	74
" Arkell	3.4	68	" Atkinson	3 7	74
" Hesketh	3.5	70	" Phillips	3.6	72
" Tolton	3.7	74	" Mulroney	3.9	78
" Graham	3.5	70	" Lamb	3.6	72
" Kitching	3 9	78	" Starkey	5.7	114
" Clair	4 0	80	" W. J. Laing	3.4	68
" Moore	3.4	68	" Peter Laing	3.6	72
" Lewis	3.9	78	Miss R. Laing	3.9	78
" Walsh	3 6	72	Mr. Roberts	3.8	76
" McNulty	3.8	76	" Hume	3.6	72
" Hanlan	4.1	82	Miss A. Lamb	3.7	74

O. A. C., September 30th, 1901.

Export of Butter in Pound Prints. A small shipment of butter in pound prints was made to London, England. At the time of writing we have not received a report on the shipment. With cold-storage facilities, there is no reason why mildly salted, pasteurized butter, put up in the form of pound blocks and wrapped in parchment paper, should not be successfully exported. We hope to make some further shipments next year.

Parchment Butter-Paper. Parchment paper now plays such an important part in the preparation of butter for local and export markets, that it would seem necessary to adopt some standard. Nearly every dealer has paper that varies in weight, color, and quality from that of other dealers. Some of the paper sold as "parchment" is useless for butter.

One firm sent us two different lots of paper which users had returned saying that it tainted the butter. Several prints were wrapped in this paper, and lots of the same butter were put up in our own paper. With the exception of one print, on which there seemed to be a slight taint, the paper proved satisfactory.

Cold Storage. Late in the year 1900, a small cold-storage building on the Hanrahan system was erected for the use of the dairy and poultry departments. So far, it has been a great aid to us in our experimental work, and has given good satisfaction, except in two points : The butter put into the refrigerator in the early part of the season had a strong "piney" flavor, due to the lining of the room with pine lumber, instead of spruce. We would recommend spruce lumber for the inside lining of the refrigerator compartment. The second point in which the cold-storage did not reach our expectations was in the removal of flavors from the cooling room. Warm poultry, placed in the refrigerator, produced a very strong odor,—sufficient to taint the butter and cheese, if left there for any length of time. Another year it will be necessary to have some other

arrangement, as it is not wise to put dressed poultry in the same room with dairy products.

Improvements Made and Needed. In addition to the cold-storage, we placed cement floors in the cheese-room and in the boiler-room of the dairy buildings. These are excellent floors, such as should be found in every cheese factory and creamery of the Province. The cost was about $11\frac{1}{4}$ cents per square foot.

To improve the draft of air from the sub earth duct to the curing rooms, a reverse cowl was placed on the ventilator of two of the rooms; and for the other, a connection was made with the chimney. Both plans worked well, especially the latter.

New rope drives have been put in place for the summer creamery and for the new dairy building.

We need more room for the instruction in hand separators given to the College classes in farm dairying. Our present room, which is largely taken up with experimental creamery apparatus, is altogether too small for efficient instruction. We must have more floor space another year. We also need an improved system of ventilation in our dairy stables, and improvement in our sewerage.

Feeding Calves. Experiments were conducted from July 4th to September 26th with six calves, in which new milk was compared with skim-milk, bran, and oats, and with skim milk, oil-cake, bran, and oats. The calves were Holsteins, Holstein grades, and one Ayrshire grade. Their ages ranged from about two weeks to five months when we began the experiment.

Calves Nos. 1 and 2 (4 and 5 months old) gained 100 pounds in three weeks on skim-milk, bran, and oats, at a total cost of 1 87 cents per pound of gain. On skim-milk, bran, and oats, and oil-cake, they gained 91 pounds in three weeks, at a cost of $2.68, or 2.94 cents per pound of gain.

Calves Nos. 3 and 4 (6 months and $2\frac{1}{2}$ months old) gained 73 pounds in three weeks on skim-milk, bran, and oats, at a total cost of $2 04, or 2.79 cents per pound of gain. On skim-milk, bran, and oats, and oil-cake, they gained 81 pounds in three weeks, at a total cost of $2 68, or 3 31 cents per pound of gain

Calf No 5, which was two weeks old when the test was begun, was fed 14 pounds new milk daily for the first three weeks, and gained 35 pounds at a total cost of $2.35, or 6 71 cents per pound of gain (milk was charged at 80c per 100 pounds) When fed skim milk, bran, and oats, and oil-cake, it gained 45 pounds in three weeks, at a cost of $1.00 for feed, or 2.22 cents per pound of gain.

Calf No. 6 (6 weeks old) fed on skim-milk, bran, and oats, and oil-cake, gained 43 pounds in three weeks at a total cost of $1.00, or 2.32 cents per pound gain.

Summary. The four older calves gained 172 pounds in three weeks at an average cost of 3.12 cents per pound of gain, when fed on skim milk, bran and oats, and oil-cake. On the skim-milk, bran, and oats they gained 173 pounds at a cost of 2 33 cents per pound gain in live weight.

The two younger calves gained 88 pounds in live weight in three weeks on skim-milk, bran, and oats, and oil cake, at an average cost of 2.27 cents per pound of gain.

The whole milk at 80 cents per 100 pounds was the most expensive food, yet it is necessary for the first three or four weeks of a calf's life, in order to rear thrifty calves.

Dairy Herd. The Dairy herd on December 15th consisted of the following: Twenty-eight cows, comprising ten pure-bred Holsteins, four Jerseys, one Ayrshire, and thirteen grade cows; eleven heifers, three Holstein, one Jersey, one Ayrshire, and six grades; nine calves, five Holstein, one Ayrshire, and three grades; making a total of forty-eight head in the Dairy Department.

The dairy herd for the eleven months, from January 1st to November 30th, supplied milk to the Dairy School and for experimental purposes to the value of $1,475 68.

In addition, milk to the value of $48 86 was sold by the quart, making a total of $1,524.54 for sales of milk from the herd in eleven months. Considerable milk was also used in the stable for rearing calves, and for experiments in calf-feeding.

A Holstein cow from the dairy herd made one of the five in the Model Dairy herd at the Pan-American Exposition during the summer, consequently her milk was lost to us for the season.

Record of the *Dairy* Herd from Dec. 1, 1900, to Nov. 30, 1901 :

Name of Cow.	Date when last cal was dropped.	Breed.	Live weight.	No. of days milking.	Total lbs. milk.	Per ct. fat in milk. Average for year.	Highest test monthly.	Lowest test montlly.	Total lbs. fat in milk.	Total lbs. butter estimated by adding 15% to fat.
			lbs.							
Mercena	Nov. 25, '00	Holstein ...	1,290	345	11.379	3 34	3.60	3.10	380 06	437.07
Meg	Mch. 17, '01	" ...	1,440	268	10.737	3.28	4.20	2.80	352 17	404.99
Daisy of R.....	Dec. 20, 00	" ...	1,180	323	9,998	3.30	3.40	3.00	329.93	379 41
Tipsy	Apr. 3, '01	Grade......	1,100	323	9 898	3.63	4.50	3.10	359 29	413.17
Margaret	Dec. 16, '00	Holstein .	1,405	343	9,033	3 27	3 50	3.00	295 37	339 67
Twenty	Dec. 1, '00	Grade	1,100	285	8,964	3 70	4 00	3 50	331 66	381.41
Molly..........	Jan. 23, '01	Grade Hol'n	1.425	287	8 917	3 64	4.00	3.40	324 57	373.25
Grey	July. 27, '01	" Shorth'n	1.125	282	8.509	3.80	4.40	3.40	323 34	371 84
Eula...........	Mch. 19, '01	Holstein ...	1.110	359	8,053	3.22	3 70	3.00	259 30	298.19
Lady S	Feb. 6, '01	" ...	1,250	336	8,004	3.63	4 60	3.20	290.54	334 12
Dolly	Nov. 23, '01	Grade Hol'n	1,410	309	7,737	3.68	4.10	3.40	284 72	327.41
Meg Netherland	Feb. 6, '01	Holstein ...	1.295	259	7,676	3.53	4 20	3.10	270.96	311.60
Carrie	Mch. 4, '01	" ...	1,180	267	7.401	3 16	3.40	2 80	233 87	268 95
Eva	Apr. 15, '01	Ayrshire ...	1,360	275	6,805	3.34	3.70	3.10	227 28	261.37
Margaret C.....	Aug. 1, '01	Holstein ...	1.264	280	6,665	3 41	4.20	2.80	227.27	261.36
Polly	June, 19, '01	Grade Hol'n	1,280	267	6,368	3.62	4 20	3 30	230 52	265 10
Bella	July 2, '01	" Ayrshire	1,220	295	6.343	3 50	3.80	3.20	222.00	255.30
Lucy	May 24, '01	" Holstein	1,165	280	5 963	3.77	4 40	3.40	225.03	258.78
Moss	May 28, '01	Grade	1,070	274	4,727	4.60	5.70	3.80	217.44	250.05
Average			1,247	297	8,114	3.54			283.44	326.00

COMMENTS ON HERD RECORD 1. The table gives the record of all milking cows which have been in the Dairy Herd from Dec. 1, 1900, to Nov. 30th, 1901

2. The largest milker for the year produced 11,379 lbs milk, containing an average of 3.34 per cent. fat, which is equal to an estimated production of 437 lbs. butter. This cow is a pure-bred Holstein. The second and third largest milkers are also pure-bred Holsteins. The second largest butter producer is a grade with probably some Short Horn blood in her.

3 The average live weight of each milking cow is 1,247 lbs.

4. The average number of days which each cow milked was 297.

5 The quantity of milk given by each cow averaged 8 114 lbs.

6. The percentage of fat in each cow's milk averaged 3 54.

7. The total average pounds of fat in the milk of each cow was 283.4, which is equal to an estimated production of 326 lbs. butter per cow.

8 We expect to make our herd average 10,000 lbs. milk, or 400 lbs. butter, per cow.

We are indebted to the Farm Department for pasture, corn silage, hay, and roots, and for sundry services in teaming. From the Dairy, the Farm has received the manure from 30 cows, and most of the surplus skim-milk, buttermilk, and whey for the season. Skim-milk has also been supplied to the Poultry Department.

All of which is respectfully submitted,

H. H. DEAN,
Prof. of Dairy Husbandry.

PART VIII.

REPORT OF THE PROFESSOR OF AGRICULTURE.

To the President of the Ontario Agricultural College:

Sir,—I have the honor to submit herewith my ninth annual report.

The most important change in my department this year, is the appointment of Mr. M. Cumming to the position of Assistant in Agriculture. This has proved a wise step, as Mr. Cumming is an enthusiastic worker and is thoroughly competent to perform the duties of assistant; and we are now in a much better position to do justice to this important branch of college work.

The course of instruction in agriculture is fully outlined in the college circular, and therefore needs no extended notice here. The live stock experiments, and matters relating to the management of the farm, are of more general interest, and a detailed report is given below.

STEER FEEDING.

Corn Silage vs. Roots.

Frequently questions have been received regarding the relative values of silage and roots for fattening animals, and while some experimental work has been done along this line, the results are by no means conclusive. This experiment, therefore, is the first of a series of experiments which we propose to conduct.

Twelve steers were divided into two groups of six steers each. One group was fed silage, hay and meal; and the other roots, hay and meal. Three pounds of hay were fed for every four pounds of roots; and three pounds of hay were fed for every four pounds of silage. The meal rations were the same for each group. The roots consisted of both turnips and mangels, turnips being fed during the first part of the experiment, and mangels near the close.

In explanation of the statement given below, it may be necessary to say that the term "dry matter" refers to what is left of any fodder after the moisture has been driven off by heating at a high temperature. Silage contains, approximately, about 20 per cent. of dry matter, and roots 10 per cent. It is true that these succulent foods vary considerably with regard to the per cent. of dry matter which they contain, but the percentages given above are fair averages. The dry matter in the hay and meal has been estimated from the latest analyses available.

Gain in Weight and Dry Matter Consumed.

——	Silage group.	Root group.
	lbs	lbs.
Weight of 6 steers Nov. 30th	6,663	6,874
Weight of 6 steers April 26th	8,127	8,281
Total gain	1,464	1,407
Dry matter consumed for 100 lbs. average live weight	250	259
Dry matter consumed for one pound increase in weight	12.62	13.95

Noteworthy Points 1. The steers receiving silage made slightly larger gains than those receiving roots.

2. The steers fed silage consumed less dry matter in proportion to their live weight than those fed roots.

3. It required less dry matter to produce a pound of increase in weight in the case of the silage fed steers than in the case of the root fed steers.

4. In this experiment, therefore, corn silage scored a decided advantage over roots.

5. It must not be forgotten, however, that this is only a single experiment, and the results must not be regarded as conclusive.

RELATIVE COST OF DRY MATTER IN SILAGE AND ROOTS. Since the dry matter of silage made such a favorable showing in the feeding test, it is of interest to study the cost of producing a ton of dry matter in the two crops. It is impossible to obtain comparisons that are true for all cases, since the cost of cultivation is influenced by the season, the nature of the soil, the presence or absence of weeds, the quality of the labor employed, and other varying conditions. At the same time, it is possible to make comparisons that are instructive, though they may not be entirely accurate.

In the farm department this year we had 8 acres of intermediate mangels lying beside 34½ acres of fodder corn. The land had all been plowed out of sod the previous fall and manured during the winter, the manuring being as nearly the same for both crops as we could make it. All labor expended upon drawing manure, spring preparation, sowing, hoeing, cultivating and harvesting was carefully recorded. The fall preparation, being the same for both, and consisting of plowing, twice harrowing, and once cultivating with spring tooth cultivator, has been valued at $2.50 per acre for both crops. Other labor was valued at the rate of $2 50 per day for man and team and $1.25 per day for each man. Considerable of the work was performed by unskilled laborers, much of it being done by students who had little or no previous experience ; so while $1.25 per day may appear a low valuation for day labor, it is really a very high average valuation under the circumstances.

It will be understood, then, that the statement of the cost of production, given below, is based solely upon the labor bestowed upon the two crops. The yield of silage was reckoned by the amount of silage in our silos, and the yield of mangels from the number of loads in waggon boxes of known capacity. A statement of the calculations is given below.

Comparison of corn silage and mangels grown in Farm department.

——	Corn silage.	Mangels.
	tons.	tons.
Total yield per acre	15	21
	$ c.	$ c.
Cost of labor per acre	9 23	19 80
Cost of labor for one ton	62	94
Cost of labor for one ton of dry matter	3 10	9 40

Since more turnips than mangels were used in feeding the steers, it would seem reasonable to use them for this comparison. The turnips were grown under such different conditions, however, that comparison was impossible, and, after all, the labor involved in growing mangels is probably less than that required for turnips. The per cent. of dry matter allowed for the mangles (10 per cent.) is also a very fair allowance for turnips.

The yields of the two crops may be called fair averages for this part of the Province.

SUMMARY. The cost of producing a ton of silage was considerably less than that of a ton of mangels ; and since silage contains, according to our estimates, twice as much dry matter as roots, the cost of producing a ton of dry matter was very much lower in the case of the corn crop.

2. When it is taken into consideration that the dry matter of silage proved, at least, equal to the dry matter of roots for fattening steers, the comparison becomes almost startling.

3. Making every allowance for errors, for variations in conditions, and for the uncertainties of a single feeding experiment, we must still admit that silage compared with roots, is a cheap and useful food for fattening steers.

4. While roots may be more expensive than silage, we would be sorry to miss them from the bill of fare provided for our stock. They are very beneficial to the health of breeding stock, and are especially valuable for young animals.

Peas vs. Corn for Fattening Steers

This is a continuation of last year's work, except that last year the peas and corn were mixed with oats, whereas this year they were not. Last year the mixture of peas and oats gave larger gains than the mixture of corn and oats, but the difference in gains was not sufficient to compensate for the extra cost of the pea mixture.

This year, twelve steers were divided into three groups of four steers each. One group was fed pea meal, another was fed corn meal, and the third was fed a mixture of equal parts by weight of corn and peas. The rest of the ration, consisting of hay, silage, and roots, was the ame for all groups. Below is given a statement of the weights, gains, and meal consumed per pound of gain live weight.

——	Pea Group.	Corn Group.	Corn and Pea Group.
	lbs.	lbs.	lbs.
Weight of four steers, November 30th	4,490	4,556	4,491
" " June 3rd	5,650	5,810	5,710
Total gain of four steers	1,160	1,254	1,219
Meal consumed for one pound increase in weight	4.139	3.823	3.901

Summary. 1 In this experiment, corn maintains its reputation as a fat producer. When the main object is the production of fat, probably no single kind of grain excels corn.

2 Peas may generally be depended upon to do better in combination with other grains than when fed singly. The close, heavy nature of pea meal renders it difficult to digest, and consequently it should be mixed with something of a lighter nature, such as oats or bran.

3. Mixing corn meal with pea meal apparently improved the fattening value of the latter, although corn meal, in a somewhat less degree, possesses the objectionable heavy nature of pea meal, and cannot be regarded as an ideal substance to mix with it.

EXPERIMENTS WITH SWINE.

Influence of Roots.

In these experiments, an effort was made to determine the influence of roots upon the rate of gain in fattening hogs, and their influence, if any, upon the firmness of the bacon produced. There were really two experiments running concurrently, and they can be described more quickly by taking them together.

Experiment A. Eight high grade Yorkshire pigs about seven weeks old, and of one litter, were divided into two equal groups, which we shall call groups I and II.

Experiment B Ten high grade Yorkshire pigs about nine weeks old, and of one litter, were divided into two equal groups which we call groups III and IV.

The rations for the different groups were as follows:

Group I. Barley and middlings.

Group II. Barley and middlings mixed with an equal weight of pulped mangels (fed raw)

Group III. Corn and middlings.

Group IV. Corn and middlings mixed with an equal weight of pulped mangels (fed raw).

The proportion of grain and middlings was the same for all groups, viz.:

October 23 to December 11, 1 part grain to 2 parts middlings.

December 12 to January 23, 1 part grain to 1 part middlings.

January 24 to May 7, 2 parts grain to 1 part middlings.

The principal points brought out in the first part of the experiment can be shown most clearly by means of a table.

Table showing gains and dry matter consumed per 100 lbs. of gain.

Groups.	Total weight Oct. 23.	Total weight May 7.	Average daily gain per hog.	Dry matter consumed per 100 lbs gain.
	lbs.	lbs.	lbs.	lbs.
Experiment A.				
Group I. 4 hogs ; barley and middlings...	169	670	.639	439.22
Group II. 4 hogs; barley, middlings and roots	168	840	.857	380.15
Experiment B.				
Group III. 5 hogs ; corn and middlings....	276	940	.677	424.55
Group IV. 5 hogs ; corn middlings and roots........................	276	1,020	.757	403.74

Noteworthy Points. It will be noticed that there is a great difference between groups I and II, both in regard to rate of gain and dry matter required for 100 lbs. increase. Indeed, the difference is so great that one can scarcely believe that it is entirely due to the difference in feeding. The individuality of the animals has undoubtedly had an influence, though they all belonged to one litter, and were divided as carefully as possible at the beginning of the experiment.

It is a significant fact, however, that in each experiment the group receiving roots made larger gains, and required less dry matter for 100 pounds gain than the group which received no roots.

In *Experiment A* abont 319 pounds of roots were equivalent to 100 pounds of meal. This may, with safety, be regarded as an abnormally high value for roots, and shows that individuality, or some unknown influence, played an important part in bringing about such a result.

In *Experiment B* 564 pounds of roots proved equal to 100 pounds of meal. This is also a very high value for roots, and is much higher than one would expect from the composition of the foods used in the experiment. According to analyses and digestion experiments, there is, approximately, about nine times as much digestible dry matter in a mixture of corn and middlings as there is in mangels. It is difficult to explain, therefore, why 564 pounds of mangels should prove equivalent to 100 pounds of meal.

There was a marked difference, however, between the hogs which received roots and those which did not in each experiment. Those which were fed roots were much more growthy and thrifty looking than the others, and showed less tendency to become fat. In fact, it was found necessary to reduce the proportion of roots towards the close of the experiments in order to get these hogs fat enough. It is possible, therefore, that the roots had a beneficial effect upon the digestive organs of the animals, causing them to digest their food better than did the others, for there is little doubt that hogs closely confined in pens are likely to suffer from indigestion.

The results indicate the need of further experiments.

Quality of Bacon Produced. In order to test what effect the roots would have upon the firmness of the bacon from the hogs in the experiments just described, the four groups were shipped to the Wm. Davies Co., Toronto, and the bacon carefully examined after it came out of the salt. Below is given the report :

"The shipment of hogs which you recently sent to us came out of salt to day, and we have pleasure in handing you a report on the same. This shipment is by far the most satisfactory which we have yet inspected, whether on account of the feed or other conditions which you have observed, we have not yet learned. It was very noticeable that the sides which turned out soft invariably belonged to hogs which were manifestly unfinished. Without exception the backs of the soft sides were thin (usually less than $\frac{3}{4}$ inch in thickness) and in general pointed not so much to lack of weight, but rather to the hogs having been marketed before they were in a marketable condition. This is true also in a wider way according to our experience. The bulk of soft sides in our house come from No. 3 and No. 4 selection, which classes comprise the light weights. In looking over these the thinness of the backs strikes one at the outset, the great majority of the

soft sides coming from hogs which have been marketed before they had sufficient fat on them, although in some cases No. 1 sides which would otherwise grade as first-class sides showed a tendency to softness. It is, however, true, even in Western hogs, that there is a tendency in the heavier weight sides to be firm, and in the light weight sides to show a disproportionate softness.

The following is the report of the four groups of hogs :—

Group No. 1: 8 sides, two of which were soft. The others grade as No. 1 sides, although there was noticeable in all a very slight tendency to pastiness.

Group No. 2 : 8 sides ; 2 sides soft ; 2 sides grading No. 2 (fat). The other 4 sides were very firm.

Group No. 3: 10 sides ; 4 sides tender, *i e.* showing softness, but not so soft as to be excluded from No. 1 sides ; 2 No. 2. The rest grade as No. 1 sides, although the class as a whole inclines to slight pastiness.

Group No. 4: 10 sides ; 4 sides soft ; 2 grade as No. 2 sides. The balance were very firm.

In the above groups 2 and 4 were superior in quality to 1 and 3, in that the No. 1 sides in the first were distinctly harder than the corresponding sides in the other two groups."

The last paragraph of the report is of especial interest, since groups 2 and 4, which are pronounced decidedly superior, are the two groups which received roots.

The two main points brought out by these experiments are :—

1. The feeding of equal weights of roots and meal gave more rapid and more economical gains than the feeding of meal alone

2. The hogs fed roots produced bacon of superior quality to those which were not fed roots.

In connection with the above it must be remembered that the quantity of roots used was a very moderate one, and the excessive use of roots might have an opposite effect.

Experiments with Pure Bred Swine

For five years preceding the present year, we had comparisons of Yorkshire, Tamworth, Berkshire, Chester White, Poland China, and Duroc Jersey swine ; and the results of these experiments have been published in the College reports. It was suggested, however, by the Dominion Live Stock Commissioner, Mr. F. W. Hodson, that an experiment embracing the same breeds as those used heretofore, but conducted on a much larger scale than the previous ones, and including a test of the value of pasture for hogs, should be conducted at several points within the Province, one of which points should be the college. The cost of the experiment was to be defrayed by the Dominion Department of Agriculture, and the hogs selected by competent men appointed by the Live Stock Commissioner or the Secretary of the Provincial Live Stock Associations. Upon these conditions, it was agreed to take one of the experimental lots, and the objects of the experiments may be summarized as follows ;

1. To compare, on a larger scale than heretofore, the suitability of six leading breeds of swine for the export bacon trade.
2. To test the economy of feeding hogs on pasture, as compared with feeding in pens.
3. To test the influence upon the firmness of bacon, of feeding rape with meal.

The original intention was to have at least ten hogs of each breed at each feeding station, and contracts were made with breeders several months before the experiment commenced, for the required number of animals. When the time for delivery came, however, it was found extremely difficult to get enough hogs, and impossible to get them all up to the standard required in the specifications. There was a wide variation in the size of the animals, and many of them were so small that it was useless to attempt feeding them on pasture with the larger hogs. The Yorkshires and Berkshires were fairly uniform, and consequently it was decided to use only these two breeds for comparing the economy of gain under the two systems of feeding. Of the remaining hogs, the larger and stronger ones were selected for putting on pasture, and the smaller and less thrifty ones were kept in the pens.

FEEDING: Early in the spring, $1\frac{1}{2}$ acres of ordinary tares, or vetches, were sown; and about the middle of May, $1\frac{1}{2}$ acres of rape were sown adjoining the tares. On July 6th, 43 hogs were turned upon one acre of the tares, the remaining half acre being retained for cutting and feeding to the inside hogs. The hogs arrived too late for the best results from the tares, as the crop had grown so high that much of it was wasted by being trampled down. On August 6th, they were given half an acre of rape, and on September 10th, another half acre, the remaining half acre being reserved for the inside hogs.

Both outside and inside hogs were fed twice a day what meal they would eat readily. The meal was fed dry, and consisted of two parts barley to one part middlings by weight during the greater part of the experiment. The inside hogs were fed all they would eat of green feed, receiving tares until August 6th, and rape after that date.

Water was provided for the outside hogs by means of Dewey hog watering fountains, which were attached to barrels, and thus a constant supply was available to the animals. Small portable pens afforded shelter.

DURATION OF EXPERIMENT: As already intimated, the experiment commenced July 6th. On Oct. 14th, the heaviest hogs, together with a number that we were sure would never make export hogs, were sent to the Wm. Davies Co., Toronto, to be slaughtered. The shipment also included a draft from a lot fed by Mr. G. B. Hood, Guelph, who conducted a similar experiment. As the rape was eaten down somewhat closely, the remainder of the hogs were brought into the pens on Oct. 14th, and fed inside until Nov. 12th, when all were shipped to the slaughter-house, together with the remainder of Mr. Hood's lot.

FOOD CONSUMED PER 100 LBS. GAIN: As explained before, only the Yorkshires and Berkshires were used to compare economy of gains from outside and inside feeding. All the inside Yorkshires and Berkshires were ready to ship on Oct. 14th, but seven Berkshires and three Yorkshires from the outside lot had to be carried over to Nov. 12th. The additional food consumed by these animals has been charged against the outside group in the following calculations: The meal consumed per 100 lbs. gain was as follows: Outside group, 525 lbs.; inside group, 395 lbs. The outside group contained sixteen hogs, and the inside, eighteen hogs.

There is such a marked difference between these two groups, that it is of interest to note how all the outside hogs compared with all the inside hogs up to Oct. 14th, the date the first shipment was made. This is by no means a fair comparison, since, with the exception of the Yorkshires and Berkshires, the best hogs were selected in the beginning for outside feeding. In making the calculation, however, several decidedly unthrifty hogs were omitted from each lot. The meal required for 100 lbs. gain was: Outside hogs, all breeds, 510 lbs.; inside hogs, all breeds, 414 lbs.

From this it will be seen that, in spite of their serious handicap, the inside hogs, as a whole, made more economical gains than the outside ones.

SUITABILITY FOR EXPORT. After they were slaughtered, the hogs were critically examined and classified by an expert at the factory. Only those heavy enough for export have been taken into consideration in the classification. The Tamworths were a very unsatisfactory lot. Several of them died, and a number of others fell hopelessly behind the rest, and finally had to be dropped out of the experiment. Originally there were 14 Tamworths, but only 4 of these were heavy enough when the experiment closed. Some of the Duroc Jerseys were good hogs, but a number of them developed into little, short, chubby animals that could never make exporters, and so were allowed to go as "scalders" with the first draft. The same fault was also more or less marked in the Poland Chinas and Chester Whites; in fact, out of ten of the latter there were only two really satisfactory animals. The Yorkshires and Berkshires were greatly superior to the rest from a feeder's point of view.

In the classification given below, "No. 1 Selection" signifies hogs suitable for best Wiltshire sides. "No. 2 Selection" refers to those of about right weight (though usually rather heavy), but too fat for best Wiltshires. "Selected Fleshy" is between No. 1 and No. 2 selections, not so objectionable as No. 2, but rather thick for No. 1. "Unfinished" denotes animals that are not fat enough, though the weights may be suitable.

Factory classification.

Breed.	No. of Hogs suitable for export.	No. 1 Selection.	Selected Fleshy.	No. 2 Selection.	Unfinished.
Yorkshire	17	14	3	....	....
Berkshire	21	15	2	3	1
Durock Jersey	12	6	2	3	1
Poland China	9	3	1	3	2
Tamworth	4	4	....	....	....
Chester White	3	2	....	....	1

The Yorkshires were, by all odds, the best lot of hogs, being much more uniform than any of the others. Some of the Berkshires gave excellent sides, but a number of them were decidedly faulty, even of those grading No. 1. There was a lack of uniformity in this group, and they varied from good length to extreme shortness. One strong point in favor of these two breeds is the fact that there were practically no culls among them. The other breeds were very unsatisfactory, the Tamworths being a particularly poor lot from the start. The four that reached the desired weight were good hogs, but since only four out of fourteen reached this weight, it is certainly a very poor showing.

FIRMNESS OF BACON. All the sides of bacon were marked in such a manner that we could distinguish the sides of the inside hogs from those of the outside group when they came out of the salt. Below is given the packing-house report:—

"The last shipment of hogs which you sent to us is just out of salt, and we have to report to you that all the sides without exception show a very satisfactory degree of firmness. Our bacon inspector's report is that all the sides grade No. 1 in respect of hardness, and my own judgment of the sides, going over them trying to find differences that might be of some value to you, was that there was practically no difference between the different sides, either in the groups themselves, which you designated by A and B, or in contrasting the two groups. Whatever your method of feeding has been in regard to these particular hogs you certainly have discovered some system that gives very excellent results."

Summary. 1. In this experiment, feeding hogs on pasture proved a very expensive method, whereas feeding in pens with the same kinds of food gave reasonably economical gains.

2. The outside hogs ate more meal and made slower gains than those fed inside.

3. The Yorkshires proved the most satisfactory lot from the packer's standpoint. The method of conducting the experiment did not permit of comparing the relative cost of gains made by different breeds.

4. All the hogs produced bacon of satisfactory firmness. This result confirms the result of a previous experiment with rape, and goes to show that a reasonable supply of green feed with a liberal meal ration produces a good quality of bacon.

5. Succulent food tends to keep animals thrifty, whether it be green food or roots, and thriftiness is conducive to firmness in the bacon produced.

6 The inside hogs consumed, on an average, nearly 4 lbs. of green food each per day, together with $4\frac{1}{3}$ lbs of meal.

7. As this proportion of green feed to meal is practically the same as the proportion of roots to meal which we have used with good results, it seems safe to assume that the use of equal weights of succulent food and meal tends to produce bacon of firm quality.

8. The time required to attend to the outside hogs was just about half of that required for those inside.

FARM SUPERINTENDENCE.

IMPROVEMENTS.

During the summer, a system of ventilation was put into the Farm cattle stables under the main barn. For a full description of this system, see report of Professor of Physics. Apparently it is doing good work, and if it proves equally satisfactory throughout the winter, it is intended to adopt a similar method for the horse and bull stables.

Some 80 rods of new wire fence have been erected during the year, and some minor alterations in the buildings have also been made.

CROPS.

MEADOW. Of hay crop, we had about 100 acres. The hay was an exceptionally good crop, the abundant moisture of May and June being very favorable for it. The average yield was about $2\frac{2}{3}$ tons per acre.

OATS. About 52 acres of the Siberian variety were sown. Commenced sowing April 15th, and harvesting, July 26th. Quantity of seed, $1\frac{1}{2}$ bus. per acre. The hot, dry weather of July ripened the crop too early, and the yield will be considerably below that of last year, though very few have been threshed at time of writing.

CULTIVATION FOR OATS. Oats followed corn and mangels. The corn roots were loosened with a plow without a mould-board, in the fall. Then the ground was harrowed, cultivated with the spring-tooth cultivator, and subsequently ribbed up with a double mould-board plow. The mangel ground was cultivated and ribbed in the fall. In the spring, the ground was harrowed, cultivated, harrowed, sown with a drill, gone over with a weeder to smooth the surface, and finally rolled after seeding was all finished.

BARLEY. About 16 acres of Mandscheuri barley were sown at the rate of a little over $1\frac{1}{2}$ bus of seed per acre. It was sown April 27th, and harvesting commenced July 23rd. As with all our grain crops this year, it ripened too quickly, and the yield will be below the average of last year.

CULTIVATION FOR BARLEY. Barley followed potatoes and turnips, and cultivation was the same as for oats after mangels.

MIXED GRAIN: This consisted of oats and goose wheat mixed in proportion of 2 bus. oats to 3 bus. wheat. About two bushels of seed per acre were used. The yield will be fair, considering the season, though a mixture of two-rowed barley and oats is probably a better one to use.

CULTIVATION FOR MIXED GRAIN. This crop was sown on about 20 acres of ground that had been in rape and millet the preceding year. The millet ground was fall plowed, but the rape ground was not plowed until spring, when it was gone over lightly with a two-furrow plow. The spring cultivation was practically the same as that for oats.

WINTER WHEAT. We had 22 acres of this crop, following peas. Dawson's Golden Chaff and Early Genessee Giant were the varieties used. It came through the winter fairly well, but rusted considerably, and was also injured to some extent by the Hessian fly. Yield, 20 bus. per acre.

CULTIVATION FOR WHEAT. The pea stubble was gang plowed lightly immediately after harvest, harrowed, rolled, and allowed to lie a week or ten days to accumulate moisture. The seed bed was prepared by means of the spring tooth cultivator and harrow, and the wheat sown with the drill on Sept. 10th to 12th at the rate of a little less than $1\frac{1}{2}$ bus. per acre. Timothy seed was sown with the wheat at the rate of between 3 and 4 lbs. per acre, and 8 lbs. of clover seed per acre was sown before the frost was out of the ground in the spring.

PEAS. This crop comprised 22 acres, 10 acres of which were grass peas. The peas were a poor crop. They started well, but seemed to blight when in blossom, and were next thing to a failure. The grass peas were not a good crop either, and ripened very unevenly. A part of the field was lower than the rest, and the peas on this part were quite green when other parts of the field were ripe. This made the harvesting very unsatisfactory, and is certainly a serious objection to the crop. The yield will probably not be more than between 10 bus. and 15 bus. per acre.

CULTIVATION FOR PEAS. Sod land was plowed in the early fall about four inches deep, rolled, and harrowed twice. Later it was cultivated with the spring tooth cultivator, most of it being gone over twice, and some of the more weedy portion three times. Manure was applied during the latter part of the winter and early spring. The land was gang plowed in the spring, harrowed, and the seed sown with the drill at the rate of $1\frac{1}{2}$ bus. per acre in the case of the grass peas, and 3 bus. per acre for the others. Date of seeding, May 9th.

MANGELS AND SUGAR BEETS. Eight acres of Bruce's Giant Yellow Intermediate mangels, and 4 acres of Danish Improved sugar beets were sown. They were sown May 13th to 15th in drills 30 inches apart, at the rate of 4 lbs. of seed per acre. Harvesting commenced Oct. 3rd, and the average yield was 700 bus. per acre.

CULTIVATION FOR MANGELS AND SUGAR BEETS. Fall cultivation practically the same as for peas. Manure was applied during the winter at the rate of about 15 tons per acre. In the spring the land was gang plowed, harrowed, rolled, gone over once, and then crossed with the grubber to loosen the lower soil, harrowed, rolled, and ribbed up with the double-mould-board plow ready for sowing. The plants were left from 12 to 15 inches apart in the rows.

CORN. Our corn this year comprised 34 acres of the Leaming variety. Planting commenced May 23rd. The cold, wet weather following planting necessitated planting a considerable part of the field a second time. It made rapid growth during the hot weather, and yielded about 15 tons of well-eared silage per acre. Cutting, which was performed by hand, commenced Sept. 14th.

CULITIVATION FOR CORN. Fall cultivation and manuring was the same as for mangels. In the spring, the land was gang plowed, harrowed thoroughly, and rolled. The corn was planted by hand in hills 38½ inches apart. The heavy rains necessitated subsequent harrowing before the corn was up, to break the crust and admit air. When the corn was a few inches high, it was cultivated both ways with a two-horse cultivator, and was afterwards gone over with the scuffler. The crop was hand-hoed twice, and some weedy patches, three or four times.

POTATOES. Seven acres of Empire State potatoes were planted in the young orchard. Planting commenced May 15th, and digging, October 17th. This was one of the best crops on the farm, the yield being over 300 bus. per acre. The seed potatoes were kept in a dark cool cellar until the weather became mild. About the middle of April, before any sprouts appeared, they were carried into the barn and spread out thinly upon the floor. Consequently, when they were planted, the potatoes were firm and sound, and any sprouts which had started were short and strong, and did not easily break off. The potatoes were cut into medium-sized pieces, leaving at least two good buds on each piece. They were dusted with land plaster immediatlely after cutting, and planted as soon as practicable afterwards.

CULTIVATION FOR POTATOES. The potatoes followed sod, which was treated as described for peas. Manure was applied in the fall at the rate of 15 tons per acre, and the land ribbed with a double mould-board plow. In the spring, these ribs were harrowed down, and the land plowed about five inches deep. The grubber could not be used on account of the tree roots. After harrowing and rolling, the ground was ribbed up with the double mould-board plow, and the potatoes planted one foot apart between the ribs, which were 28 inches apart. The ribs were split as soon as possible after planting, so as not to leave the potatoes long exposed to the sun. When the soil had become somewhat firm, it was harrowed lengthwise of the ribs, and later, cross harrowed. It was again harrowed when the plants were beginning to show. Subsequent cultivation comprised scuffling and hoeing to keep down weeds and prevent baking of the soil. Four sprayings with Paris green were found necessary.

TURNIPS. Less than 3 acres of Hartley's Bronze Top were grown in the orchard adjoining the potatoes. They were sown June 18th on drills 28 inches apart, and the plants were left from 10 to 12 inches apart in the rows. The yield was nearly 900 bus. per acre.

CULTIVATION FOR TURNIPS. Cultivation was very similar to that given the potato ground, with a few minor modifications to suit circumstances.

RAPE. About 8 acres were sown on new and swampy ground. Part was sown with the grain drill on the flat in rows 21 inches apart, and part had to be sown broadcast. It was sown June 29th, and pastured by steers in September and October.

LIVE STOCK.

The most important addition to our herd during the year is a yearling Shorthorn bull bred by Wm. Duthie, Collynie, Scotland, and imported in dam by Messrs. H. Cargill and Son, Cargill, Ont. He is a good individual, and his breeding is first-class. There has also been purchased for us, in England, a Hereford bull calf, at the dispersion sale of the Court House herd of John Price. This calf will probably not reach the College before February.

We are retaining practically all over our pure-bred heifer calves, and while this policy lowers the revenue for the present, it will give us a chance to make a more satisfactory selection at a later date.

BULLS. In Shorthorns, we have one aged bull and two yealings. Of other breeds, we have one Aberdeen-Angus, one Hereford, one Holstein, one Ayrshire and one Jersey.

FEEDING BULLS. The bulls receive a mixture of about equal parts by weight of cut hay and chaff, with 18 to 20 lbs of roots each in addition. The meal ration varies with circumstances, the aim being to feed enough to keep them in good breeding condition. Oats and bran constitute our favorite meal ration, though we sometimes feed the younger animals a little oil cake with it.

BEEF BREEDS OF COWS AND CALVES. These comprise the following; Shorthorns, 3 cows, 4 yearling heifers and 3 heifer calves. Herefords, 2 cows, 1 yearling heifer, and two heifer calves. Aberdeen-Angus, 2 cows, 1 yearling heifer, and 2 heifer calves, Galloway, 2 cows, 1 bull calf, and 1 heifer calf.

FEEDING BEEF BREEDS OF COWS. The bulky part of the ration consists at the present time, of cut hay, pulped roots, and silage in the proportion of 3, 4, and 6 parts by weight respectively. These proportions are subject to change to suit circumstances. None of the dry breeding cows receive meal. Those suckling calves are fed a light meal ration from 3 to 5 lbs., depending upon conditions. Yearlings get little or no meal, as a rule. Calves are fed what they will clean up readily of oats and bran, with sometimes a small proportion of oil cake. The meal ration of all breeding stock is usually about one-third bran, the remainder being made up with almost any grain, or mixture of grains that is available; oats, barley, and wheat being the most commonly used, with the addition of pea meal at times.

MILCH COWS. In this class we have 4 Holsteins, 1 Ayrshire, and 8 grades. We are keeping the heifer calves from the best cows, and hope, in the course of time, to build up a more uniform herd than we have at present.

FEEDING MILCH COWS. The milch cows are fed the same foods as the beef breeds, but are given about 20 lbs. of roots at noon, and are fed 7 to 8 lbs. of meal each per day when in full flow.

STEERS. Fifteen steers are being fed in the farm stables at present. Three of these are fat steers which were purchased for the use of students, and for the short course in January. The remainder were bought in September, pastured on rape until Nov. 1st., and then taken into the stables.

FEEDING STEERS. The steers are fed the same bulky food as the other cattle. Their meal ration consists of about one part bran to four parts ground grain, which is a mixture of oats, barley, and wheat. It is intended to drop the oats very soon, and replace them with something cheaper, probably rye, if present prices continue. Through November they were fed only about 3 lbs of meal each per day. This has been increased to 4 lbs, and will be gradually increased until it reaches 8 or 9 lbs. by April 1st.

SHEEP. Small flocks of Shropshires, Oxfords, Leicesters, and Cotswolds are maintained. We are in need of better quarters for our sheep. The pens should be on higher ground, and larger yards for exercise should be provided. Until this is done, it is useless to attempt carrying a larger stock.

FEEDING SHEEP. As grain is dear and somewhat scarce, we purpose feeding none to our sheep, except the lambs, which will receive about half a pound of grain each per day. About four pounds of turnips each per day, with clover hay, will constitute their ration until a month or so before lambing, when the roots will be somewhat reduced, and a little bran and oats added.

SWINE Breeding operations are restricted to Yorkshires, Tamworths, and Berkshires, though other leading breeds are represented in our experimental work.

FEEDING SWINE Breeding sows, and young sows over six months, subsist largely upon refuse from the College kitchen, pulped mangels, and a very limited ration of mixed meal, usually about equal parts of middlings, barley, and wheat, with an occasional addition of oats. They are given exercise in a covered shed, and provision is being made for a pasture in summer The kitchen refuse and roots are reduced about a month before farrowing. A ration composed largely of middlings and bran does very well for this period. When suckling pigs, they are fed liberally. One-third of their meal ration is usually

middlings and bran, and the remainder a mixture of grains. Skim-milk is also added when available and in a sweet condition.

Equal parts of finely ground barley and middlings, with skim-milk, does very well for young pigs. We usually wean pigs at from 6 to 8 weeks, and try to have them eating well before they are weaned. When skim-milk is not available, there is greater need for postponing weaning, and we have sometimes exceeded the limit given above.

Financial Statement.

The appropriations for the farm and experimental feeding departments were not kept separate during the past year, but in the statement which follows an attempt has been made to charge against the farm department only those things which properly belong to it. Also, credit has been given the farm for materials supplied to other departments, for which it received no equivalent.

Dr.	
To inventory live stock, Jan. 1, 1901—	
Cattle	$3,755 00
Sheep	886 00
Swine	635 00
Horses	616 50
" Permanent improvements	215 24
" Wages	3,195 79
" Purchase of stock	3,185 10
" Maintenance of stock	600 00
" Seed	231 09
" Repairs	385 90
" Furnishings	150 00
" Implements	196 94
" Postage, stationery, etc	15 00
" Fuel and light	30 00
" Binding twine	31 00
" Contingencies	150 00
" Portable engine bought in 1900 (10 per cent. of $825)	82 50
To balance	642 27
	$15,003 33

Cr.	
By sales of cattle	$1,693 56
" " sheep	598 82
" " swine	1,776 09
" " horses	55 00
" " milk	160 93
" " hides	8 92
" " wool	24 86
" Miscellaneous sales	21 67
" Service fees of male animals	211 00
" *Dairy and Exp. Feeding Depts :—*	
3,485 bu. roots at 7c	243 95
94 tons hay at $6	564 00
250 tons silage at $2	500 00
Pasture for 35 cattle, 5 months at $2	350 00
" *College :—*	
900 bags potatoes at 50c	450 00
58,160 lbs. milk at 80c per cwt	465 28
Keep of 3 horses at $75	225 00
Work of horse drawing sewage	50 00
" *Experimental Dept.:—*	
Keep of 5 horses at $75	375 00
" *Garden Dept.:—*	
Keep of two horses at $75	150 00
" Loss on live stock through keeping many different breeds for educational purposes	400 00
" Inventory live stock, Jan. 1, 1902—	
Cattle	4,831 25
Sheep	362 00
Horses	797 00
Swine	689 00
	$15,003 33

I have the honor to be,

Your obedient servant,

G. E. DAY,

Professor of Agriculture.

PART IX.

REPORT OF THE PROFESSOR OF HORTICULTURE.

To the President of the Ontario Agricultural College :

SIR,—I have the honor of presenting herewith my ninth annual report on the work of the Horticultural Department.

The many duties devolving upon the head of this department, usually requiring prompt attention, give but little time for relaxation; but the varied and interesting nature of the work has always been sufficient to make duty a pleasure. I am pleased to say that, on the whole, steady progress has been made throughout the year, although I regret that we have not accomplished so much as was desired, because of the lack of regular and competent assistance.

COURSES OF INSTRUCTION.

The class-room instruction given under the general head of Horticulture has embraced a course of about 30 lectures throughout the spring term to the students of the first year on the leading principles in the growth of trees; production of new varieties; methods of propagation; and general management of orchards and fruit plantations. For the first four weeks at the beginning of the fall term the new students were taken twice a week through the orchards, gardens, and other branches of this department, and the nature of the work was explained to them. This was done with a view of impressing upon them at the beginning of their course the importance of learning all they possibly could by using their powers of observation.

To the students of the second year, a course of about sixty lectures was given, two per week throughout the College year. In this course all of our Canadian-grown fruits were taken up and studied in detail; the subject of vegetable gardening was dealt with at length; and the latest and most approved methods of cultivation with the various crops was discussed. Landscape gardening and floriculture were taken up sufficiently to give students an intelligent idea of the principles involved in properly laying out and beautifying their home surroundings.

The instruction in the class-room in these subjects was supplemented by practical work throughout the year in the orchards, fruit plantations, vegetable gardens, on the lawn, and in the greenhouses.

In connection with the work in floriculture, the students were first required to become as familiar as possible with the different kinds of plants in the greenhouses; and, after some practice in methods of propagation, were allowed to propagate during their spare time whatever they wished, on the understanding that it might be taken with them when they went home in the spring. This plan of stimulating an interest in the work, as well as a love for flowers, proved quite satisfactory, as nearly every member of the class, upon leaving the College in April last, took with him a choice collection of house plants of his own propagation. We have no doubt these were gladly received by the sisters at home, who have not as yet had an opportunity offered them to take a course at the College themselves.

A short course of lectures in forestry was also given to the students of the second year, dealing more particularly with the forestry problems in Ontario, and with practical methods of growing trees and managing wood lots, shelter belts, wind-breaks, etc., on the average farm.

A more extended course in the same subject was given to the students of the fourth year, covering two hours a week throughout the fall term. In this class, the students themselves were required to give most of the lectures, using Prof. S B Green's admirable little book on "Forestry in Minnesota" as a text-book. This method of taking up the work we have found to be an excellent one with the more advanced students, as each one has to prepare his work carefully to lay it before the class, and the practice of taking charge of the class helps to develop self reliance.

Development of Department.

The development which has been made in this department of recent years well warrants the substitution of the more comprehensive name Horticultural Department for that of "The Garden," by which it was formerly known. The department, as now constituted, includes the orchards, vineyard, and small fruit plantations, the vegetable and flower gardens, the lawn and arboretum, the shelter belts and forestry plantations, and the conservatory and greenhouses, in all covering about eighty acres. On the greater part of this an immense amount of care and labor has to be expended annually to keep these various features of the work at all times in proper condition.

Teaching by Object Lessons.

The importance of not only keeping everything in good condition, but of being abreast of the times and adopting the latest and most approved methods in the work, may be understood when it is remembered that we have every year about 30,000 visitors during the month of June, and probably as many more at various times throughout the year, and most of these visitors are here to see and learn all they can by observation. We have realized the importance of this fact, and have endeavored to conduct the work so that, as far as possible, it may afford valuable object lessons for those who come to see; and we have reason to believe our efforts in this line have not been in vain.

Experimental Work.

In several branches of the work experiments have been in progress for a number of years, and much valuable information has been obtained, particularly with variety tests of small fruits, tomatoes, and various ornamental plants.

The young orchard set out five years ago was also planted with a view to gaining information as to the varieties of larger fruits best adapted to this locality. This orchard is made up of a large number of varieties of apples, pears, plums and cherries, and a few of the more tender fruits, such as peaches and quinces. During the past season, quite a number of the young trees began bearing, although this was what might be called an "off year" for such fruits.

Strawberries.

For the past six years we have been conducting an extensive variety test with strawberries. During this time two hundred and seventy five varieties have been included in the tests. Careful notes have been taken upon the habits of the plants and the character of the fruit of each variety, and every picking has been carefully weighed and recorded. In this way some valuable data have been obtained. One of the striking features of this work has been the great variation in the relative standing as to the yields of the different varieties from year to year. This shows clearly the folly of jumping at a conclusion from the results of one or two experiments, as it is only by taking the average of a number of experiments that conclusions, at all reliable, can be reached.

As an instance of this we may mention the two varieties at the head of the list this year and last. In 1900 Clyde held first place for total crop, while this year it has dropped to thirty-sixth place on the list. Wesley, which in 1900 stood thirtieth on the list, is at the top this year.

One of the most uniform in its yields has been Stone's Early. In 1896 this variety stood thirteenth; next year it was second; and in 1898 it was first. In 1899 it was again second; last year it was seventh; and this year it was third. Considering the large number of varieties included in the test, it has made a remarkably uniform and good record for productiveness; but, notwithstanding this, we have this year placed it on our list of varieties to be discarded, because of its small, soft, sour fruit.

As mentioned in our report last year, there are many points besides productiveness which have to be taken into account in selecting varieties of strawberries.

In the plant we look for vigor and freedom from disease, ability to propagate freely, and a pollen-bearing blossom. In the fruit we would like to find large size, smooth roundish form, rich red, showy color, firmness of flesh, and good quality. But to get all

these excellencies combined in one variety is the difficulty; for, notwithstanding the many varieties that have been tested, we are still looking for the ideal strawberry.

There is considerable variation in the season of ripening of different varieties, so that they may be classed as early, midseason and late; and, for this reason, as well as because of the difficulty of getting all the good qualities in one berry, we believe it is best for the grower not to restrict himself to less than half a dozen kinds, particularly if growing them for home use.

Were long tables not out of order in this report we would like to present a full report on the one hundred and seventy-five varieties fruited this year, but at present we must content ourselves by making a selection of a few of those which have proven most desirable. As the result of another year's test, we would not materially alter the list as given in last year's report, unless it might be to leave out Jocunda Improved, because of its lack of productiveness, and add one or two of the most promising varieties.

Among the leading early varieties are Sadie, Wesley, Anna Kennedy, and Van Deman.

Sadie has now been fruited here for four years, and it has made a good record not only for earliness, but for total crop. It is a vigorous grower and a good pollenizer for other early pistillate varieties. The berries are not large, but are round, plump, firm and of good color.

Wesley has also fruited here for four years, and this year heads the list for total crop. It is a very vigorous growing pistillate sort. The fruit ripens early and, although not very large, it is shapely, firm and of good color.

Both *Anna Kennedy* and *Van Deman* produce much larger and more handsome berries than the two varieties already mentioned, but they lack productiveness and vigor of plant.

Among the best of the mid-season varieties are Clyde, Irene, Warfield, Tennessee Prolific, and Williams.

Clyde made a much poorer showing this year than ever before, dropping to thirty-sixth place on the list; but for the three years previous to this it easily ranked as the best main crop variety. The plant is vigorous, the flower perfect, and the fruit large, well shaped, and fairly firm, but the color is hardly dark enough for a first-class berry.

Irene has again made an excellent record, doing much better this year than Clyde. It is a vigorous plant maker, but the blossoms are pistillate and require a perfect flowering variety like Clyde to furnish pollen. The fruit is of medium size, well shaped, firm, and of a handsome dark color.

Warfield has now been fruited here for six years in succession. It is an old standard that has its ups and downs, depending upon the seasons. In showery seasons it makes a great yield, but in times of drouth its leaves curl up and the fruit fails. It also is a pistillate variety, requiring an early flowering pollenizer, like Sadie or Van Deman, to furnish pollen for its early blossoms. The fruit is of medium size, firm, and of the dark rich color so much desired for canning.

Williams and *Tennessee Prolific* have also been fruited for six years, and have, on the whole, made very good records. Both are vigorous growers, bearing good sized firm berries. The Williams is now more extensively grown throughout the country than any other variety as a market berry, but its green tip detracts much from its appearance. Tennessee Prolific has not this defect.

Saunders, *Buster*, and *Satisfaction* rank among the best late varieties. Saunders has now been under test for six years, and is well deserving of a place in any collection for home use or market.

Buster and *Satisfaction* have been tested for four years. The former has made an exceptionally good record for productiveness. The berry is large but not firm enough or dark enough for a first-class berry.

Satisfaction, although ahead of Buster this year, has not, on the whole, proved so productive, but the fruit is firm, of fair size and handsome appearance.

Raspberries.

In our first plantation of raspberries, set out in 1895, there were about fifty varieties. A careful record has been made of the yield from these for the past five years, and an average of these yields gives a pretty good idea of the capabilities of the varieties under test.

Columbian and Shaffer easily head the list for productiveness. These varieties belong to the purple cane family, and are very vigorous growers, propagating by tip-rooting like the black raspberries. The fruit is a dull-red or purple color, of good quality, but not showy enough for a market berry, although excellent for home use. Of the two varieties Columbian has proven to be a little hardier and slightly more productive than the Shaffer.

Of the bright red varieties, Marlboro', Cuthbert, and Loudon still rank among the best. Marlboro' begins fruiting a week or ten days earlier than Cuthbert; while Loudon is almost intermediate between the two. These are all fairly hardy here, are very productive, and the fruit is large, firm and attractive in the market.

One of the most promising new varieties which fruited here for the first time this year is the Herbert. This is a seedling introduced by R. B. Whyte, Ottawa, which shows decided merit. The plants are hardy, vigorous, and productive, and the fruit is large, showy, and of good quality.

Golden Queen is the best of the yellow fruited varieties, and although not a market variety, it is a desirable one for home use, as its golden yellow berries lend a beautiful contrast to that of the darker colored varieties for table use.

Black Raspberries.

We have now twenty-five varieties of black raspberries in our collection, about half of which have been under careful test for five years. The following table shows those varieties which have stood near the top of the list during that time:

Rank	1897	1898	1899	1900	1901
1st	Palmer	Mammoth	Older	Hilborn	Eureka
2nd	Souhegan	Older	Gault	Palmer	Gault
3rd	Older	Gregg	Eureka	Kansas	Smith's Giant

From this it will be seen that there has been quite a number of varieties competing for first place, as no less than ten appear in this short table. Although it is difficult to arrive at a conclusion as to which is the most productive black raspberry, it is not difficult to determine which are a few of the best quality.

Older has proved to be one of the hardiest and until the last two seasons it usually stood near the head of the list for productiveness. The berries are very large, black, without bloom, moderately firm, juicy, and of good quality.

Eureka, which heads the list this year, has been fruiting here for five years, and has, on the whole, made an excellent showing. It ripens early and gives a long season of fruiting. The berries are large and fairly firm.

Gault, which stood second this year and also in 1899, has been fruiting for four years, and is also a large, firm, fine berry.

Smith's Giant is a new variety that originated with A. M. Smith of St. Catharines. The fruit is extra large, firm, and very late. This variety is evidently going to prove of value.

Currants.

The results of the experiments with currants the past season tend to confirm those reported last year. From among the thirteen varieties, which have now been tested for five years, Victoria, Fay's Prolific, and Belle de St. Giles may be selected as, on the whole, the most satisfactory red varieties.

Raby Castle and *Prince Albert* gave larger yields, but the berries are much smaller, and not so desirable for either home use or market.

White Grape still ranks as not only the best white currant, but every year, for the past five years, it has yielded about half as much again as the most productive red variety, and about three times as much as the heaviest yielding black variety.

Black Naples now ranks as the most productive of our black currants, although between it and Champion there is very little choice. Neither of them has proven so productive here as they should be, and we are looking for something better in our new plantation, which should begin bearing in another year or two.

This new plantation contains altogether forty-six varieties, and was set out late last fall. There are about seven hundred bushes in the plantation, and not one of them was lost in transplanting, which goes to show that fall planting is quite safe with currant bushes, at least when the conditions are at all favorable. The bushes this year have made excellent growth.

Gooseberries.

A dozen varieties of gooseberries, six of them American and six English, have been under test for five years in succession, and the results have been more uniform than in any other of our experiments. All of the English varieties have suffered every year from mildew, while none of the American varieties have been affected.

The following table gives the average yield per bush for the five year's fruiting :—

American Varieties.		*English Varieties.*	
Pearl	62.03 ozs.	Autocrat	8.49 ozs.
Downing	60 59 "	Crown Bob	6.57 "
Houghton	52.41 "	Whitesmith	5.01 "
Champion	35.56 "	Industry	2.67 "
Red Jacket	32.25 "	Triumph	1.18 "
Smith's Improved	14.52 "	Dominion	.25 "

From this it will be seen that in our experiments even the least productive of the American varieties, Smith's Improved, gave nearly double the yield of Autocrat, the most productive English variety, while Pearl, the best American variety, gave seven times the weight of crop of Autocrat

Pearl and *Downing* produce large greenish white berries, and are so nearly alike in all particulars that there is no necessity for growing them both.

Houghton, the oldest of the American varieties, produces a small red berry, and Champion, a small green berry, both of which are inferior to Pearl.

Red Jacket has not held out what it at first promised in the way of productiveness, but its berries are about one-half larger than those of Pearl, so that, on that account, it is well worthy of a place in any collection.

Smith's Improved is a light yielder, but bears a very sweet, medium-sized berry, that ripens a week or more earlier than any of the other sorts.

A new plantation of gooseberries, containing over 40 varieties, was set out last fall, and has made fair growth the past season This collection contains a number of hybrids between the English and American types, and we are looking forward with interest to the results therefrom.

Tomatoes.

For four years we have been conducting a variety test with tomatoes, in which fifty-five varieties have been included. Careful notes have been taken of the important characteristics of each variety, and records have been made at each picking of the weight of sound ripe fruit and rotten fruit. Account has also been taken of the amount of green fruit left on the vines at the end of the season. With regard to the unripe fruit, this varies with the different seasons; but, on the whole, it has not amounted to more than two or three pounds per plant.

The amount of rotten fruit, however, varies very much, not only with the season, but with the different varieties.

This year, there was comparatively little rot on any of the varieties; but last year when the rot was very prevalent, we had opportunity of noting its effect upon the different varieties, and it was found that while some kinds were quite exempt from the disease, others lost from one-third to one-half their crop from this cause.

In the following list is given a few of the varieties which have made the best yields :

Average results of four year's tests.

1. Atlantic Prize	224	ozs. per plant
2. Earliest of All	209	"
3. Golden Queen	184	"
4. Ignotum	147	"
5. Paragon	146	"
6. Aristocrat	117	"
7. Dwarf Champion	113	"
8. Livingstone's Beauty	108	"

Average results of two year's tests.

1. Express	214	ozs. per plant
2. Plentiful	180	"
3. Prudy's Best	148	"
4. Crimson Cushion	116	"
5. Combination	114	"
6. Fordhook Fancy	83	"

Average results of three year's tests.

1. Mayflower	189	ozs. per plant
2. Extra Early Advance	170	"
3. Imperial	155	"
4. Royal Red	152	"
5. Longkeeper	147	"
6. Ponderosa	145	"
7. Fordhook First	141	"
8. Trophy	137	"

Grown for one year only.

1. Dominion Day	246	ozs. per plant
2. Thorburn's Century	191	"
3. Freedom	190	"
4. Climax	183	"
5. Magnus	171	"
6. Success	126	"
7. Earliana	111	"

From this list, Atlantic Prize, Earliest of All, Mayflower, Express, Plentiful and Dominion Day might be selected as a half-dozen of the most valuable varieties.

Co-Operative Experiments.

In connection with the Experimental Union, we have, during the past eight years, been carrying on a series of co-operative experiments with small fruits. The work was begun with sixty experimenters, and was at first beset with many difficulties and discouragements; but, by persistent effort, we have overcome many of the early difficulties, and now have on our books the names of over one thousand experimenters in all parts of the Province, who are conducting, on their own farms, one or more of these tests with small fruits. During the time we have been engaged in this work, we have distributed : 2,256 currant bushes; 3,220 gooseberry bushes; 3,600 blackberry bushes; 4,440 red raspberry bushes; 4,440 black raspberry bushes; and 25,008 strawberry plants,—making a total of 42,964 plants.

This large number of plants of the leading varieties distributed in small lots all over the Province, is having its influence in encouraging fruit growing in many places where it was never before attempted, and that our efforts are being appreciated we have abundant evidence in the reports of experimenters that are annually sent in.

The value of this work, however, cannot be given in a mere summary of the results of the different experimenters. The greatest value naturally accrues to those who conduct the experiments. A full account of the nature and results of the experiments will be found in the Experimental Union Report.

The work has grown to such an extent that some provision will have to be made for regular assistance if it is to be continued, as the nature of the work necessarily entails a large amount of clerical work upon the head of this department.

Fruit Exhibit at the Pan-American.

The laurels won by Canadians in the Horticultural, as well as in most other departments of the Pan-American Exposition, has been a matter of general congratulation. Our orchards here were not sufficiently in bearing to enable us to keep up a display throughout the season, as was done by other exhibitors, but we did what we could and sent about 100 jars of our choicest varieties of small fruits, such as strawberries, raspberries, currants, and gooseberries. These were put up in antiseptic fluids so as to preserve the fruit as nearly as possible in its natural state. This collection formed one of the central features of the Ontario exhibit during the greater part of the Exposition, and for it this Department was awarded one of the 35 bronze medals given to Ontario exhibitors.

Inspection of Fruit Experiment Stations.

The inspection of the Provincial Fruit Experiment Stations, now established in different parts of the Province, is another of the duties devolving upon me as head of this department. There are now fourteen of these stations, and they are so located that nearly every part of the Province has one or more such stations to which it may look for information as to the kinds of fruit best adapted to that section. As far as possible, each of these stations was visited at the most opportune time for seeing what was being accomplished. While visiting the stations I have had an excellent opportunity, not only of learning what progress was being made at the station, but of getting an intimate acquaintance with the status of fruit-growing in every part of the Province; and the knowledge so acquired has been of incalculable value to me in my college work with the students. A full account of this work will be given in my report to the Board of Control of the Fruit Experiment Stations.

Meetings Attended.

The holding of Orchard Institute meetings this year in the ten different parts of the Province was a new departure in institute work, that proved very successful. These meetings were arranged for by the Director of Institutes and were mostly held at the fruit experiment stations. At his request, I attended eight of the meetings, and gave addresses and led discussions on various questions connected with orchard management. As these meetings were held right in the orchards, such operations as grafting, budding, pruning, spraying, cultivating, etc., were usually practically illustrated. The meetings I attended were at:

The Burlington Fruit Experiment Station, at Mr. A. W. Peart's, Burlington; Mr. J. Elliott's orchard, Agincourt; the Simcoe Fruit Experiment Station, at Mr. G. C. Caston's, Craighurst; the Bay of Quinte Fruit Experiment Station, at Mr. W. H. Dempsey's, Trenton; the South-western Fruit Experiment Station, at Mr. W. W. Hilborn's, Leamington; the Huron Fruit Experiment Station, at Mr. A. E. Sherrington's, Walkerton; the Grimsby Fruit Experiment Station, at Mr. L. Woolverton's, Grimsby, and at the Georgian Fruit Experiment Station, at Mr. John Mitchell's, Clarksburg.

Besides these, I attended a joint meeting of the Hamilton Horticultural Society and the City Improvement Society, at Hamilton, and gave an address on "The Beautifying of Lawns and Gardens"; a meeting of the Guelph Horticultural Society, where I gave a talk on "Window Gardening"; the annual meeting of the Fruit Growers' Association held at Cobourg, where I presented a report on the New and Seedling Fruits examined during the year; and the annual meeting of the Experimental Union, where I gave a report on Co-operative Experiments with Small Fruits.

Acknowledgments.

In conclusion, I beg to acknowledge with thanks the following donations to this department during the past year:

Brown Bros. Co., Brown's Nurseries, Ont., twenty-four blackberry and fifty five black currant bushes.

F. W. Porter, Mount Forest, seedling gooseberry bushes.

C. L. Stephens, Orillia, seedling gooseberry bushes.

S. Spillett, Nantyr, "Green Chisel" gooseberry bushes.

Rev. E. B. Stevenson, Jordan Station, seven new varieties of strawberries.

A. M. Smith, St. Catharines, two "Toronto" peach trees.

W. H. Dempsey, Trenton, scions of fourteen varieties of apples.

Jas. Goldie, Guelph, collection of hardy perennials.

Respectfully submitted,

H. L. HUTT,

Professor of Horticulture.

PART X.

REPORT OF PROFESSOR OF BACTERIOLOGY,

To the President of the Ontario Agricultural College:

Sir,—I have the honor to submit herewith a brief report of this year's work in the department of Bacteriology.

My assistant, E. W. Hammond, D.V.S., left me at the commencement of the year to accept a position with the City Dairy Company of Toronto, and his place was not filled until the end of June, when I was fortunate enough to secure the services of H. Streit, D.V.M., of the University of Berne, Switzerland. Dr. Streit had formerly been the assistant of Prof. Dr. Guillebeau in the Veterinary School at Berne, and the excellent training he received there fitted him well for both research and routine work in a Bacteriological Laboratory.

Lectures.

The usual course of lectures to the Second Year on Bacteriology and its relation to Agriculture and Dairying, was given in the winter semester, and I think the time has now arrived to give some laboratory instruction along these lines. Unfortunately, however, the accommodation is too small at present and the resources of the laboratory too limited to attempt work of this character.

The special dairy class monopolized nearly all my time during the winter semester. The class was large, the laboratory small, and the apparatus and appliances meagre; consequently the students had to be divided into six divisions, and the same work repeated six times. I trust that a different arrangement will be made in the near future, as the waste of time last year was very great and the wants of other classes had to be sacrificed. The specialists in Agriculture and Dairying now take more or less bacteriology. Lectures and laboratory work form part of their course, the aim being to give them a good grounding in general bacteriological work, and special training along their respective lines. The only graduate of last year took his thesis in my laboratory.

Publications and Personal Visits, etc.

During the year the following papers have been issued: "The Ripening of Cheese, and the Rôle of Micro-organisms in the Process."—Transactions of the Canadian Institute, 1900, pp. 103-134.

"The Agglutinating Substance."—Centralblatt für Bakteriologie, 1900, Abte. I.; and several articles in the agricultural press of the Province.

Personal visits were made to Innerkip, to investigate the cause of bitter cheese in the East Zorra factory; to Bradford, to inquire into the reasons for an epidemic among the fowls in that locality; and, in the absence of Prof. Lochhead, I went to Streetsville, with a view to trace the cause for the bad rusting of cereals in that district. A report of this was made to Prof. Lochhead, and reference was made thereto in a publication of the Biological Department "On the Grain Rusts."

I gave an address on "Milk as an Agency in the Conveyance of Disease," to the South Wentworth Women's Institute, and also two lectures to the pupils of the Ontario Normal School of Domestic Science at Hamilton.

I have also given two lectures to the patrons of the Innerkip factory "On bitter milk and cheese."

Investigating Disease Amongst Poultry.

Mr. W. L. Smith accompanied me to Bradford and gave the results of the trip to the readers of the "Sun," as follows:

"Some little time ago Superintendent Graham, of the Poultry Department of the O. A. C., made an investigation in the section about the lower end of Lake Simcoe, where such serious losses have occurred in poultry during the last few years. Just how

serious these losses have been will be understood from the statement made by one of the losers. James Ferris in one season lost no less than 300 fowls, and this year he has lost 100 out of 200. This is possibly one of the most serious cases of the lot; but over a district probably ten miles one way by five or six the other, losses more or less serious have been sustained in nearly every farmyard during the last four or five years—the losses in some cases extending back over a period of seven or eight years.

"When Superintendent Graham inquired into the trouble early in July, he was of the opinion that the outbreak was of the nature of cholera; but, a bacteriological examination by Prof. Harrison of the carcasses of some of the fowls that died of the disease, showed that all the deaths were not due to the same cause; in fact, in none of the cases examined by Prof. Harrison was death due to true cholera. In some cases worms were present in the intestines, and these were, apparently, either a prime or secondary cause of death.

"In order to secure the fullest possible information on the case, Mr. Harrison last week visited the infected district himself, and inspected a number of yards where losses had occurred. In all of these the fowls, at times, have access to stagnant water in the barnyard, and the hen-houses, while kept in fairly good condition, contained more or less of the droppings of the fowls.

"Many of the owners of the premises in which these conditions exist have, ever since the disease first appeared in their yards, been spending time and money in an effort to cure that disease.

"'What is really required,' said Prof. Harrison, in referring to this fact, 'is not a cure for the disease, but the removal of the causes which ensure its continuance—the prevention of access to foul water in the barnyard, and the thorough and regular cleansing of the hen-houses being the first steps necessary in that direction.'"

"'But present conditions as to water, etc., have always existed; then why should these cause greater trouble now than in the early days?'

"This is the answer almost invariably made to statements such as the foregoing.

"In answer to this, and speaking on the general question, Prof. Harrison said: 'When a country is new, before it has become fouled with habitation, things may be done with impunity which cannot be done later on without entailing the most serious consequences. Take a military camp, by way of example. The very first thing done when such a camp is being established is to prepare latrine-trenches, which serve as water-closets. Guards are also placed on water supplies in order to prevent contamination. Despite these and other precautions, the camp ground soon becomes foul, and troops, save in the stress of necessity, seldom remain long in the same place.'

"*How Disease is Spread.* Precisely the same state of affairs exists in a barnyard. In the course of time disease germs of various kinds are deposited there, and unless the most thorough precautions are taken as to cleanliness, these germs will develop and multiply with disastrous results. In the case of worms in fowls, the eggs pass off through the droppings, and are then picked up by other fowls, and reproduction goes on. The same in the matter of germs. These are spread around the barnyard, and develop and multiply in the stagnant water. All the conditions necessary to the development and multiplication of disease are, in fact, soon present, unless everything that can be done towards keeping the place in proper sanitary condition is done.

"*Removal of Droppings and Whitewashing.* 'What should be done to put poultry yards generally in proper sanitary condition?' I asked.

"'The very first thing,' replied Prof. Harrison, 'is to see that the roosts, laying-boxes, and floors,—in fact, all parts of the poultry house,—are scraped thoroughly clean. When this has been done the place should be whitewashed with a solution made in the proportion of 20 gallons of lime water to one gallon of crude carbolic acid. The lime used for this purpose should be fresh, and dissolved in sufficient water to reduce it to the consistency of milk. The material may then be applied with a sprayer, and should be applied to every part of the buildings occupied by the poultry. In addition to this, the fowls should be absolutely prevented from obtaining access to foul water. Even if a sufficient supply of fresh water is furnished hens, they will sometimes take the dirty water. It would be well, indeed, if poultry houses could be put up apart from the ordinary farm buildings altogether. The model plan is that adopted in some parts of

England, where poultry houses are moveable structures that can be removed from place to place. Under this system hens are not kept on foul ground, and during the summer, by removing from place to place, the cost of feeding is materially reduced ; but, whatever else is done, prevention from access to foul water is one of the first essentials to the healthy condition of fowls.'

" *Where the Use of Gravel Comes in.* Mr. John Ferris, one of those who has suffered least from the local trouble, has used fresh gravel extensively in his yard. He has used this as a covering in some places which would otherwise be damp and more or less foul ; he has also used it freely for the purpose of furnishing grit for the fowls—a load of gravel serving one hundred hens in his case for about six weeks. His practice is to dump a load in the yard, and when the hens are fed to rake the grain into this gravel, thus compelling the hens to scratch for their living, and at the same time ensuring the taking in of a certain amount of grit with the grain by the fowls.

" 'That is a good thing to do,' said Prof. Harrison, speaking in regard to this matter. 'Hens require grit in order to digest their food properly. I do not think it is a good thing to put down so much in the feeding place at one time, as the droppings accumulate more or less in this, and these furnish a possible source of contagion. It would be better to have a fresh supply of gravel every week (every day perhaps not practical). This gravel, however, is not a cure for the disease. The purpose it accomplishes is to assist in the digestion of the food ; and, by so assisting, it tends to keep the birds in a good healthy condition ; and anything that does this assists in providing resisting power against disease. We must remember that amongst poultry, as well as in the human family, disease is sometimes present in a latent form. You will sometimes find diphtheria germs in the throat of a perfectly healthy man. Those germs may never develop ; but reduce that man's vitality from any cause, by exposure to dampness, by cold, or even by over-exertion, and the germs may develop into a virulent form of disease. The same is true in regard to hens. When they are reduced in vitality, from any cause, they are liable to attacks from disease, which they would throw off if the general conditions were kept up to the standard.

"*How Natural Conditions Tell.* 'If it were not for the wide range which fowls have over the open fields on the average farm, conditions would be very much worse than they are. During the summer time, for fourteen to sixteen hours per day, fowls have a range over hundreds of yards of clean ground. This enables them to resist the influences which surround them during the night when in premises which are not perfectly clean. If they were kept in confinement all the time, where these conditions are ever present, trouble would soon break out. What is required is to secure for the fowls, as nearly as possible, the natural conditions surrounding wild bird life. These are: Pure water, uncontaminated ground, and plenty of air and sunlight. The latter are of special importance. The windows in most poultry houses are not large enough and are too high up. They should be so placed as to allow the sunlight to reach every part of the premises occupied by the fowls. The sun is, after all, the greatest purifier we have.

" *To Facilitate the Work of Cleaning.* 'As a means of keeping houses clean, there is nothing more effective than the placing of boards beneath the roosts for the catching of droppings. This greatly facilitates the work of cleaning. If land plaster is placed on these boards, after the droppings are scraped off, it will absorb the liquid in the droppings, and add to the fertilizing value of the material. These droppings, mixed with plaster, make an excellent fertilizer, and are particularly valuable for plum trees. In a word, what is required is not a cure for the disease, but a removal of the causes which perpetuate disease. This may be accomplished by keeping hen houses thoroughly cleaned ; whitewashing freely with lime and carbolic acid ; making sure that the hens have access to nothing but pure water ; furnishing free access to ground that has not been contaminated ; and providing suitable food, with plenty of grit to assist in its digestion.' "

Laboratory Work.

During the year (10½ months), 188 doses of tuberculin and 114 starters, or cultures, or cheese and butter-making have been sent out.

Diagnoses, or bacteriological analyses, of the following substances have also been made and the results reported directly to those sending the material:

Milk with bad odours, or tainted	11
Bloody milk	1
Milk suspected of conveying disease	4
Unchurnable cream	1
Water	18
Off-flavored cheese	14
Off-flavored butter	7
Foul brood	3
Diseased organs	7
Anthrax	2
Symptomatic Anthrax	1
Diseased hens and turkeys	29
	98

The above does not include the large number of analyses (320) of milk, can-washings etc., made for patrons of the East Zorra factory in the county of Oxford.

Copies of the following circular, slightly altered from the one sent out from the Bacteriological Department in 1899, were sent to all cheese and butter factories in the Province, and the effect of this announcement may be seen in the large number of samples which were sent to the College:

Assistance Offered to Creameries and Cheese Factories.

It is the wish of the Bacteriological, Chemical, and Dairying Departments of the Ontario Agricultural College to get into touch with the makers in the cheese factories and creameries of the Province, with a view to rendering assistance in cases of difficulty which may be due to undesirable bacterial or other infections.

Difficulties frequently arise; and we might mention a number of cases to show that within the last two years certain troubles or affections in factories were found to be caused by infection with harmful bacteria. The following may be mentioned as some of the most frequent causes of trouble:

Principal Causes of Troublesome Bacterial Infections in Cheese Factories.

Defects in the factory itself. In new or modern factories there are not likely to be any grave defects in the building; but in some of these constructed years ago, there may be defects in construction, or needed repairs may be neglected. Probably the commonest defects are:—

(1) Leaky floors, which allow whey or other liquids to drop through and decompose, giving rise to bad odors and very undesirable kinds of germ life that get into the vats and cause serious trouble.

(2) Flies, which are a great nuisance in factories, as they feed or walk upon all kinds of decomposing materials and then visit the cheese factory, crawling over or dropping into the milk and depositing various kinds of germ life, which are thus placed in situations favorable for further growth and development.

To avoid the trouble from leaky floors many of the best factories in the United States and Canada are putting in cement floors.

Faulty Equipment. Great care should be taken to buy good utensils and see that they are kept in repair. The joints of the tinware are often badly soldered and in some places not soldered at all. All joints should be made by lap-jointing and soldered flush with the tin. If this is not done, small spaces are left which it is impossible to keep clean and sweet; and these become so many crevices for the development of germ life.

Bad Drainage. Several examples of bad flavored cheese caused by germs in drainage filth have occurred during the last two years. In these instances the drains have usually been blocked, or have not had sufficient fall to take away the drainage quickly. Consequently masses of putrid material, whey or buttermilk, have collected in certain parts of the drain and have given rise to trouble in the factory.

Defects in Cheese.

Gassy Fermentations. This is the worst and commonest trouble in cheese factories, and is caused by bacteria breaking down the sugar in the milk and producing gas therefrom. This gas causes the appearance known to cheese makers as pin hole or gassy curds. These harmful germs gain admittance to the milk in the process of milking or after the milk is drawn from the udder. Particles of manure, stagnant water, and dirty pastures contain this class of gas producing germ in large numbers; and it is easy to see how they gain access to the milk by careless milking. Cows lying on the ground or walking through stagnant water get their hairy coats seeded with these noxious forms; and they are dislodged from the animal's coat into the milk pail by the movements of milking. The high temperature at which milk is usually kept during the summer favors their growth and they consequently become very numerous in the milk. We have recently made several analysis of water sent from cheese factories, and have found therein large numbers of gas-producing germs.

To avoid as far as possible the contamination from milking it is advisable before commencing:—

(1) To brush well the cow's udder and that part of her thigh, flank, and side next to the milker.

(2) To rub the udder and teats carefully with a clean, damp cloth.

Bad Flavors. There are many well known defects in cheese, generally indicated by such expressions as "off flavor," "not clean flavor," "tainted," "goose flavor," "yeasty," "bitter," etc, all of which are abnormal flavors due, in the majority of instances, to noxious bacteria gaining access to the milk—sometimes by carelessness in milking, as explained above; sometimes from dirty whey tanks; sometimes from carrying sour whey in milk cans; and other times from the use of contaminated well-water.

The cheese in an eastern factory was pronounced "off flavor," and an examination revealed the fact that the germ causing the trouble was in the well-water which was used in setting the vats. The water had acted as a starter; and a change in the water supply at once removed the trouble.

The high temperatures of curing rooms in the summer time favor the growth of many of these undesirable germs in cheese.

Color or Pigment in Cheese. A number of abnormal changes manifested by the production of various colors in cheese are caused by bacteria. A common result from such bacteria is red or rusty cheese, the discoloration being noticeable on the edges of the particles of curd. Blue, black, and green cheese are also caused in this way, but not so frequently.

Mottled or discolored cheese likewise belongs to this category.

Difficulties in the process of Manufacture of the Cheese.

Imperfect Coagulation. Cases where normal coagulation could not be secured have been found to be due to lack of lime in the milk and to the alkali nature of the water used in setting the vats.

Loss of Fat. In some sections, at certain seasons of the year, abnormal loss of fat occurs for which no good reason can be given.

Preservatives. Where it is suspected that some preservative has been used to keep the milk sweet, a sample may be sent in for examination.

Defects in Butter.

Lack of Flavor. This trouble is often due to the absence of the proper flavor-producing organism, a condition which is overcome by the use of a culture. In a lengthy research on the flavor of butter caused by the bacteria commonly found in milk, we separated some twenty different species, made starters from each species, and inoculated pasteurized cream therewith, in order to ascertain the effect of each individual species on the flavor of the butter. In the majority of the cases the butter lacked flavor; and in six instances it had a very undesirable taste.

"*Putrid Butter*," "*Lardy Butter*," "*Bitter Butter*," "*Fishy Butter*," *etc.* The peculiar tastes or flavors of all these varieties are caused by the presence and growth of undesirable bacteria in the cream.

Having thus briefly referred to some of the more common defects in factories, and the causes of many of the troubles in the manufacture of butter and cheese, we may emphasize the fact so often stated, viz., that the markets of the world are becoming more and more particular and want nothing but prime articles. Hence it is necessary to make and export only the best produce.

Samples.

In order to help makers we are prepared to undertake the bacteriological and chemical investigation of any of the above or similar troubles. Whilst it is manifestly impossible for us to investigate every difficulty which may arise, we are willing to inquire into all serious troubles, or all cases in which the trouble is continuous. We shall do our best to find the cause and suggest remedies.

With this object in view, we ask that samples of milk, butter, or cheese injuriously affected in any way be at once sent to the Dairy department, with a letter giving all details as fully as possible. Large quantities need not be sent; but care must be taken to send samples which fully represent the trouble complained of. About two ounces of butter or cheese and three or four ounces of milk, whey, or buttermilk are sufficient; and if properly packed they may be sent by mail.

If any doubt arises as to the purity of the water used in the factory, send it to us and we will examine it for the presence of gas-produing germs and as to its general suitability for factory use. Send about four ounces in a clean bottle that has been thoroughly washed out with boiling water. Where an exhaustive analysis is necessary, more water will be required. In such cases the examination will be both chemical and bacteriological; and the following directions are given :—

Samples of Water for Analysis.

Container. A bottle of not less than one-half gallon capacity is to be used, preferably one with a glass stopper. If there is no glass stopper, the bottle must be fitted with a new cork.

Preparation. The bottle must be thoroughly cleaned, all foreign substances being removed. Then it must be scalded out with boiling water, and allowed to drain until cool.

Taking of Sample. If the sample is to be taken from a well, the water must be pumped out for about five minutes, or long enough to empty all pump connections, before the sample is taken; if from a tap, the water must be allowed to run to waste for about ten minutes, or long enough to empty all local laterals, before sampling. Water standing in the pipes in a house is under very favorable conditions for the multiplication of bacteria. If, therefore, the precaution of running off the water be not taken, a very erroneous conclusion as to the number of bacteria present, may be drawn. If the sample is taken from a lake or stream, it must be taken some distance from the shore, the samdling vessel being plunged, say, a foot and a half below the surface, to avoid the surface scum. Samples are not to be taken immediately after a storm. Wherever the sample is taken from, the bottle must be rinsed out several times with the water to be analyzed before the sample is taken. The bottle must not be filled quite full; a small space must be left for the expansion of the water. It must be tightly corked and a piece of cloth tied over the neck to keep the cork in place. Sealing wax must not be used.

Packing. The bottle must be packed in ice. The water should arrive at the laboratory at, as nearly as possible, the same temperature as when the sample was taken.

Notification. Send notice by mail stating by what express company you are sending the water, and the date of the shipment. Also give as fully as possible the history of the well or source of the water, and remarks on the sanitary surroundings.

Note. On application a suitable bottle, properly prepared, will be sent to the applicant.

Personal Visits.

In cases where the affection is a serious one, a personal visit may be necessary, and will be made.

Cultures.

A second branch of our work, which we think will be of benefit to makers, is the manufacture of good cultures for use in making both butter and cheese. At present none of these are made in Ontario; and although they may be procured from the United States, the duty and consequent trouble prevents many from using them.

We, therefore, announce that a culture which possesses good flavor and aroma will be sent to any who apply for it. Applicants must state whether they want it for cheese or for butter.

In order to pay the cost of bottle, mailing case, postage, etc., the small charge of twenty-five cents per bottle will be made. Stamps will be taken instead of money, if it is more convenient for the applicant.

Application for cultures should be addressed to F. C. Harrison.

Alkaline Solutions.

Recognizing the value of the alkaline solution to the factoryman, and the difficulty he has had in obtaining it, we offer to furnish the solution to those who want to make use of it at a nominal cost of $1 per gallon. When 10 c. c. of milk or cream is taken as a sample, one gallon of the solution will make about 400 tests. Applications for this solution should be addressed to R. Harcourt, Chemical Department.

Money or stamps must in all cases accompany the applications for cultures and alkaline solutions.

H. H. Dean,
Prof. of Dairy Husbandry.
F. C. Harrison,
Prof. of Bacteriology.
R. Harcourt,
Assoc. Prof. of Chemistry.

Ontario Agricultural College,
Guelph, April, 1901.

Assistance Offered to Veterinarians and Farmers.

For the year 1902, I would supplement the circular issued to dairymen by offering assistance to veterinary surgeons and others interested in the care of live stock.

There is in connection with the Provincial Board of Health a laboratory for research work in human pathology; but at present there is not any laboratory in the Province devoted to the solution of the problems which are constantly arising in the veterinary art. In many cases, we might, we think, give material aid, by investigating the *cause* of a disease, or in diagnosing obscure cases. We are enabled to do this because of our laboratory appliances. No veterinary surgeon or stock man keeps high power microscopes, incubators, and the other necessary laboratory apparatus for bacteriological or pathological work; and yet these are often essential to a correct diagnosis of the diseases of live stock. We shall mention in order a few points on the subject of what to send and how to send it.

In cases of disease,—send the organ or material, carefully wrapped in an antiseptic wrapper, giving full particulars regarding it. It is best to send by express; and in summer it may be necessary to pack in ice.

In cases supposed to be or suspected of being:

Anthrax,—send an ear, or some of the blood, spleen, or liver of the dead animal.

Symptomatic Anthrax, *Black-leg*, *or Quarter Evil*,—send the parts infected, as this disease is usually in the muscles.

Malignant Œdema (similar to black leg, but showing more fluid in the subcutaneous tissues, which, unlike the fluid found in cases of black leg, is almost colorless),—send the part affected.

Tetănus or Lockjaw,—on account of the difficulty of finding the bacillus of this disease, it is almost useless to send material, unless the point of inoculation is known, in which case, cut away and send the flesh around the point of inoculation.

Glanders (a disease which affects either the nasal passages or the skin, in the latter case called *Farcy*),—send some of the ulcers from the parts infected, or of the discharge from the nasal passages.

Hog Cholera and Swine Plague,—send any diseased portions of the animal.

Actinomycosis, or Lumpy Jaw,—send in a bottle a little of the matter found in the tumor mass.

Rabies, or Hydrophobia,—send the base of the brain or *medulla oblongata* of the animal suspected.

Tuberculosis and Pseudo-Tuberculosis,—send any tubercles or diseased glands.

In cases of diseases affecting poultry, such as Chicken Cholera, Roup, Tuberculosis, or Blackhead,—send the whole bird.

Research Work.

The research work undertaken during the year is as follows:

1. The difference in the bacterial content of milk heated to 140°, 160°, 185°, and 200° F., in conjunction with Prof. Dean. See Prof. Dean's report, Part VII. of this volume, and a special bulletin by Prof. Dean and myself.

2. Research on the effect of cold storage on the bacterial content (total number of bacteria) of Cheddar cheese, in conjunction with Professors Dean and Harcourt. See Prof. Dean's report.

3. Research on the ripening of cheese and the rôle of micro-organisms in the process, in conjunction with Prof. Harcourt and with the assistance of the College cheesemaker, through the courtesy of Prof. Dean.

4. On the duration of the life of the tubercle bacillus in Cheddar cheese.

5. An investigation of the causes which produce bitter cheese.

6. The gas-producing bacteria found in milk, and their effect on the making and ripening of Cheddar cheese.

Of the above, Nos. 1 and 4 are completed. The results of No. 1 will shortly be issued in bulletin form; and No. 4 is ready for publication; but there is considerable work yet to be done on Nos, 2, 3, 5, and 6

In closing this report, I should like to place on record my appreciation of the services of my assistant, Dr. Streit. He has been faithful, efficient, and conscientious in all the work entrusted to his care.

Respectfully submitted,

F. C. HARRISON,

Professor of Bacteriology.

PART XI.

REPORT OF EXPERIMENTALIST.

To the President of the Ontario Agricultural College :

SIR,—I have the honor of submittting herewith my report of the work done in the Experimental Department during the year 1901.

AGRICULTURE IN EUROPE.

Within the past year, I have visited upwards of fifty of the leading Agricultural Colleges and Experiment Stations in Germany, Switzerland, and Austria Hungary ; France, Belgium, and Holland ; England, Scotland, Ireland, and Wales. Having spent my boyhood days on a farm, having devoted the past fifteen years to agricultural experiment work in Ontario, and having visited twenty-one Agricultural Colleges and twenty-three Experiment Stations in the United States, I greatly appreciated the opportunities of the past summer. A few observations regarding the agriculture of the different countries might not be out of place in connection with this report.

From the complete and comprehensive system of agricultural education given in some of the European countries, we have much to learn. In France, for instance, agricultural instruction forms an important part of the general system of the public education,—the pupils starting their agricultural studies in the public schools when only seven years of age. In carefully systematized and thoroughly conducted scientific research directed along special and well defined lines and continued for long periods of time, some of the European Experiment Stations were pioneers in the work and are leaders to the present day. In the investigation of seed, the improvement of farm crops, and the production of beet sugar ; in the economical use of land and the thorough cultivation of the soil ; in the management of the forests and the construction of good roads we can also obtain valuable lessons from the people of Europe.

Europe is doing much for agricultural science ; America is doing much in the *application* of agricultural science to *practical* agriculture. I could not find so close a relationship between the scientific and the agricultural world in any of the countries of Europe as I find in America, and especially in our own Province of Ontario. In higher agricultural education for farmers' sons ; in Agricultural Experiment Station work for the farmers ; in co-operative experiments in agriculture by the farmers themselves ; and in a complete and comprehensive system of Farmers' Institute meetings, I have failed to find anything either in Europe or in the United States, equal to what we have in Ontario. Generally speaking, the farmers of Ontario own the farms which they manage, and hold a position among their countrymen which is good socially, intellectually, and financially. They take a keen interest in the application of those methods suggested by science or by practice which tend toward the advancement of agriculture.

FIELD EXPERIMENTS AT THE O. A. C.

The practical work in the Experimental department consists in planning the various experiments ; laying out, seeding, and looking after the field plots ; harvesting, threshing, and weighing the grain ; taking up, weighing, and storing the potatoes and roots ; cutting, weighing, and harvesting the grass, clover, corn, and fodder crops, etc. ; and also in picking by hand the samples of grain grown on the plots, some to be sown on the plots the following year, and some to be distributed for co-operative experimental work throughout Ontario. But few people realize what a large amount of very careful thought is required in planning, examining, and supervising these experiments, and in studying and summarizing the results for presentation in reports, bulletins, newspaper articles, and lectures.

EXPERIMENTAL GROUNDS.

About fifty acres of land, divided into something over 2,000 plots, is used for agricultural field experiments, conducted with varieties of grain, root, tuber, grass, clover,

fodder, silage, and miscellaneous crops; with artificial, green, and farm-yard manure; with methods of cultivation, selection of seed, dates of seeding, etc., all with the greatest care and for several years in succession, in order to secure strictly accurate and reliable results. These experiments deal with the crops grown on over nine-tenths of the cultivated land in Ontario; that is, fully 10,000,000 acres.

Experimental Plots.

The experimental grounds have a gentle slope toward the southwest, and the soil is what might be termed an average clay loam. About one quarter of the land is manured each year with twenty tons (about twelve loads) of farm-yard manure per acre. It will thus be seen that the land receives farm-yard manure once every four years. No commercial fertilizers are used, except in distinct fertilizer experiments, which occupy from two to three acres each year, and on which tests are made to ascertain the comparative value of different fertilizers with different crops. The plots vary in size according to the requirements of the different experiments, and the yields per acre are determined from the actual yields of the plots in every instance.

Instruction to Students.

All first year students are taken to the experimental grounds in the fall term and in the class room in the winter term, and the experimental work is explained to them. Besides this, the students of both the first and second year help in the various operations of the department, for which they are paid from four to nine cents per hour. In this way our students become acquainted with many of the results of our field experiments, observing the advantages which come from cultivating and manuring the soil in certain ways, sowing seed of different selections, and growing the best varieties of grain, corn, roots, potatoes, grasses, etc. They also become interested in experimental work, and afterwards prove themselves our most successful co-operative experimenters on their own farms.

Farmers Conducting Experiments.

The system of co-operative experiments in agriculture which is conducted conjointly by the Experimental department of the College and the Ontario Agricultural and Experimental Union, is doing good service for the Province. In 1886, twelve of the ex-students of our College conducted practical experiments on their own farms and eight of this number furnished satisfactory reports of results obtained. From that date there has been a steady and substantial growth of the co-operative work in agriculture, and this year there were about three thousand ex-students and other Ontario farmers who conducted experiments at their own homes. For the results of the co-operative experiments, the reader is referred to the annual report of the Ontario Agricultural and Experimental Union, which is printed and distributed by the Department of Agriculture, Toronto, Ont.

RESULTS OF EXPERIMENTS.

All our field experiments are conducted for at least five years before any of them are dropped. For the results of many of the tests which were carried on for five years previous to 1901, the reader is referred to former reports. The results of some of the experiments which have as yet been conducted for only one or two years are held back until the tests can be carried through another summer. As different seasons vary so much in temperature, amount of rainfall, etc., the average results of experiments continued for several years are of much greater value than those secured from only one year's work. We submit the results with much confidence in their reliability, and in their real practical value. The writer has good reason to believe that the work of the experimental department is being appreciated by the farmers of the Province, and that the results are being studied more and more each succeeding year. I shall limit my remarks on each separate experiment to a few of the points which seem to be of the greatest general value to the agriculture of Ontario.

Seed Grain Selections.

Within the past eight years a large amount of very careful work has been done to determine the influence of different selections of seed upon the resulting crop. The reader's attention is directed to the results of this experiment, which are becoming more valuable from year to year, owing to the increasing number of times that the experiment has been repeated. Fresh seed has been taken each year from the grain grown in the Farm department. It will, therefore, be understood that whatever difference there is from the influence in the selection of seed, that difference is attributed purely to the size and the selection of the seed for the separate years in which the tests were made. For the large plump seed, none but well developed grains were selected; for the small plump sample, the grains selected were of a uniform character, and for the shrunken sample, none but shrunken grains were used,—the last selection being made regardless of the size of the kernels. The sample of broken grain in the case of barley contained nothing but grains which were broken crosswise; split grain in the case of winter wheat contained nothing but grains which were broken lengthwise, and split seed in the case of peas contained peas which were split, but not broken. The grain from which these selections were made was all threshed with a grain separator, and the splitting and the breaking of the grains was, therefore, done in the usual process of threshing. In the selection of a large plump seed, one-half pound was carefully weighed from each class of grain. The number of large plump seeds of each kind of grain was then counted, and a corresponding number was taken of the medium-sized grain, the small plump grain, the shrunken grain, and the broken grain. The different selections were sown upon plots of similar size. The average results of this experiment are here presented in tabulated form :—

Results of experiments in seed grain selections repeated in each of 5, 6, 7 and 8 years.

Class of grain.	Number of years that tests were repeated.	Selections.	Weight of grain per measured bushel.	Average yield per acre (from 5 to 8 years.) Tons of straw.	Average yield per acre (from 5 to 8 years.) Bushels of grain (by weight.)
			lbs.		
Oats	7	Large seed	33.2	1.9	62.0
		Medium-sized seed	32.2	1.8	54.1
		Small seed	31.8	1.8	46.6
Barley	6	Large plump seed	49.5	1.5	53.8
		Small plump seed	48.8	1.5	50.4
		Shrunken seed	49.1	1.4	46.0
		Broken seed	48.6	1.3	43.2
Peas	5	Large seed	57 8	1.3	30.3
		Small seed	57.6	1.1	23.9
	8	Sound seed	59.3	1.4	30.7
		Split seed	58.7	.6	10.0
Spring wheat	8	Large plump seed	59 1	1.4	21.7
		Small plump seed	58.3	1.3	18.0
		Shrunken seed	56.9	1.2	16.7
Winter wheat	5	Large plump seed	59.5	2.4	42.4
		Small plump seed	59.3	2.0	34.8
		Shrunken seed	59.3	1.9	33.7
		Split seed	53.8	.5	8.0

On examining the average results for the number of years during which this experiment has been conducted, the reader will see that the large plump seed gave the largest

yield of grain per acre with oats, barley, peas, spring wheat, and winter wheat ; and also that large plump seed produced grain which weighed more per measured bushel than any other selection with each of the grains under experiment. As the splitting of the peas and winter wheat is apt to have injurious effects upon the germs, the yields from seed thus damaged are very poor. The table of results here presented is worthy of very careful study by those who wish to have increased success in grain production.

Continuous Selection of Seed Oats for Nine Years in Succession.

For nine years in succession an experiment has been conducted with Joanette oats by selecting large, plump, well-developed seeds ; light-weighing and light-colored seeds ; and also seeds from which the hull had been removed by the separator. The experiment was begun in the spring of 1893 by selecting seed from the general crop of the Joanette oats of the previous year. The selection made in each of the following years has been from the product of the selected seed of the previous year. The number of grains used on each plot was carefully counted, and an equal number was used of each selection in each of the years in which this experiment has been conducted.

As the selection for this experiment has been continuous, selecting the seed each year from the crop produced in the year previous, the average results are of but little value, but the final results are interesting, valuable, and quite suggestive. In the crop produced in 1901, it was found that the large plump seed produced 44.4 bushels ; the light seed, 28.5 bushels ; and the hulled seed, 37.0 bushels per acre.

In weight per measured bushel, the crop produced from the large plump seed weighed five pounds more than that produced from the light seed, and practically the same as that produced from the hulled seed. From the results here presented, it will be seen that the seed which was hulled by the separator produced fairly good results in yield of grain per acre and in weight per measured bushel. When it is considered that it is only a well-developed seed having a large kernel and a thin hull that will be hulled in the threshing, and that the hulling seems to cause but little injury to the germination of the seed, the good results from the hulled seed appear to be quite reasonable. The difference, however, between the large, plump, well-developed seed and the light-weighing and light-colored seed is very marked, and shows the great importance of sowing the former and discarding the latter.

Grain grown in Mixtures for the production of Grain and Straw.

In an extensive experiment conducted for six years in succession in growing oats, spring wheat, barley and peas, separately and in various combinations for the production of grain and straw, it was found that a mixture of barley and oats gave the highest yield of grain per acre. Having ascertained that a mixture of oats and barley was well adapted to a large production of grain, it became of importance to know the best proportions of these grains to use in the mixture to give the most satisfactory results. It was, therefore, decided in the spring of 1900 to conduct an experiment in sowing nine different proportions of oats and barley, in order to determine which mixture and which quantity of seed would give the best results in the production of grain and straw. The following gives the amount of oats and barley per acre used for seed in the different mixtures : 1. Oats, ½ bus. and barley, ½ bus. 2. Oats, ½ bus. and barley, 1 bus. 3. Oats, ½ bus. and barley, 1½ bus. 4. Oats, 1 bus. and barley, ½ bus. 5. Oats, 1 bus. and barley, 1 bus. 6. Oats, 1 bus. and barley, 1½ bus. 7. Oats, 1½ bus. and barley, ½ bus. 8. Oats, 1½ bus. and barley, 1 bus. 9. Oats, 1½ bus. and barley, 1½ bus. This entire experiment was conducted in three places in our experimental grounds in 1900 and again in 1901. In the average of three experiments, it is found that the mixture of 1 bushel of oats and 1½ bushels of barley per acre produced the largest yield of grain in 1900, and the second largest yield of grain in 1901. In taking the average of the two years, the mixture here mentioned has produced the highest yield of grain. In yield of straw per acre, however, it is found that 1½ bushels of oats and 1 bushel of barley made the highest record. The lowest yield of grain per acre was produced from a mixture of 1½ bushels of oats and ½ bushel of barley per acre in each of the two years in which this experiment has been conducted.

In growing a mixture of oats and barley for the production of grain, it is important to select those varieties which require about the same length of time to reach maturity. If a standard variety of oats, such as the Banner or Siberian, is used, it is important to select some late variety of barley, such as the Chevalier two-rowed, in order that the two varieties may mature at the same time. If a standard variety of barley, such as the Mandscheuri or common six rowed is used, it is then necessary to select some early varieties of oats, such as the Daubeney or Alaska. In each of the past two years, an experiment was conducted with three different mixtures which would reach maturity at different times. The following gives the varieties in each of the three mixtures: 1. Mandscheuri barley and Daubeney oats. 2. Siberian oats and Chevalier barley, and 3. Poland White oats and Kinna Kulla barley. The first two mixtures here named produced the largest yields of grain per acre in each of the past two years.

Comparative results from cultivating and Plowing Root, Potato, Rape and Corn Ground.

An experiment is in progress in which sections of land that had produced potatoes, fall turnips, Swede turnips, mangels, carrots, rape, and corn, were partly cultivated and partly plowed the following spring and afterwards sown with oats, spring wheat, barley, and peas. The plowing and cultivating for each separate test were done simultaneously. Those portions of land which were cultivated were stirred to a depth of from $2\frac{1}{2}$ to $3\frac{1}{2}$ inches, and those portions which were plowed were turned over to a depth of about 5 inches. The work was thoroughly done by both methods. The results show that in the case of peas, the yield of grain per acre was larger from the plowed land than from the cultivated land which followed each of the seven crops here mentioned In yield of wheat, oats, and barley per acre, however, the results are quite similar for the two methods, the cultivated land giving slightly the best results with wheat and the plowed land with oats and barley.

Methods of cultivation for Oats and Barley.

In 1901 an experiment in soil cultivation was carried on with both oats and barleys In No. 1 plot the land was cultivated to a depth of 6 inches, after which the grain was sown with a grain drill and the land was then rolled and harrowed. The treatment of No. 2 plot was similar to that of No. 1, with the exception that the land was cultivated to a depth of only 3 inches No. 3 plot was treated in the same way as No. 2 plot, with the single exception that the land was not harrowed after it was rolled. In No. 4 plot, nothing was done to the land after the grain was sown. This experiment was conducted in duplicate with both oats and barley, thus making in all sixteen plots. The results of this experiment for this year were somewhat irregular, and no definite conclusions can be drawn from the test. The experiment will likely be repeated for several years.

Varieties of Oats.

Our experiment station has spared no pains in conducting experiments with different varieties of oats, in order to ascertain the most suitable kinds for cultivation throughout the Province. Two hundred and twenty-eight varieties have been grown on uniform plots in our experimental grounds within the past fourteen years The greater number of these have now been grown for five years in succession, and definite data have been obtained each year regarding the height of plants, the strength of straw, the susceptibility to rust, the yield of grain, the yield of straw, the weight per measured bushel, etc., of each variety As there are about two and a half million acres of Ontario land devoted to the oat crop each year, we have felt justified in doing a large amount of work to find out the best varieties for the Province, and have, therefore, imported seed from a great many countries in different parts of the world, and both the foreign and Canadian varieties have been tested under uniform conditions. Of all the varieties which have been grown in the past, we have found that the White Siberian, the Oderbrucker, the Vick's American Banner, and the Bavarian to be among the very best for general cropping. All these varieties have given large yields of grain, which is of good quality. The straw of each variety grows to a good length and generally stands up well, the heads are spreading, the grain is white in color, and the hulls are comparatively thin. The Joan-

ette Black oats have produced a very large yield of grain; but as the straw is exceedingly short, they are only suitable for soil which naturally produces a very large amount of straw. When the Joanette oats are sown on rich land, they should be sown very thinly, as they stool abundantly, and if sown thickly are apt to be a failure. The Daubeney and the Alaska have proved to be two of the very earliest varieties of oats to ripen, and are suitable for those localities which require a very early oat, or for sowing in combination with six rowed barley.

Seed Oats from Different Latitudes.

Four years ago our experiment station sent seed oats of six varieties to the experiment station in the State of Missouri. Arrangements are made by which the Missouri station and our own can exchange seed yearly, with the object of studying the influence of environment on the production of oats for seed. In the spring of 1900, and again in the spring of 1901, we received from the Missouri Experiment Station southern-grown seed of the same varieties as we forwarded to Missouri two and three years previous. The six lots of Missouri seed were sown beside the six lots of Ontario seed in each of the two years, and the average results of the test show that, as a rule, the Missouri seed produced the largest yield of grain per acre, and that the Ontario seed produced oats which gave the heaviest weight per measured bushel. The intention is to repeat this experiment for several years until more conclusive results are obtained.

Varieties of Six-Rowed and Two-Rowed Barley.

Within the past fourteen years a large number of both six-rowed and two-rowed varieties of barley have been under experiment in our trial grounds The results show, that for general purposes, the six-rowed barleys have given much better results than the two-rowed varieties. Among the six-rowed barleys which have been grown for a number of years in succession, the Mandscheuri variety from Russia has given decidedly the best general satisfaction. It produces a good length of straw which usually stands up well, the yield of grain per acre is excellent, and the weight per measured bushel is nearly always about three pounds above the standard. In comparison with the common six-rowed barley of Ontario, we find that in the average results of these two varieties for the past thirteen years, the Mandscheuri has surpassed the Ontario variety by about nine bushels per acre. Some of the other varieties of six-rowed barley which have given the best results are the Oderbrucker, the Scotch Improved, and the Imperial Six-Rowed.

We have grown in the experimental grounds a greater number of two rowed barleys than we have of the six-rowed varieties. Of all the varieties under experiment, however, it has been found that in the average results for several years the best two-rowed barley has given about thirteen or fourteen bushels of grain per acre less than the best six-rowed variety. In cases where a late variety of barley is desired to grow in combination with a medium-ripening variety of oats, it is necessary to secure a barley that is slow in reaching maturity, and there appears to be no varieties so well adapted for this purpose as those belonging to the two-rowed class. Both for growing separately and for growing in combination with oats, the New Zealand Chevalier and the French Chevalier are among the very best varieties.

Varieties of Hulless Barley.

Within the past few years a great deal has been said and considerable has been written in Ontario regarding one or two varieties of Hulless barley. The grain of the Hulless barley usually weighs about sixty pounds per measured bushel, while the standard weight of the common varieties in Ontario is forty-eight pounds per measured bushel. The skin of the Hulless varieties is thin and transparent, and is white, purple, or black in color. The grain resembles wheat more than it resembles barley. The straw is apt to be weak, and when ripe becomes so brittle that the heads are frequently broken off. Some of the varieties possess heads with six rows, and others with two rows. Among the twelve varieties which we have grown for several years in succession, the Guy Mayle, Purple, and Black Hulless are the varieties which have given the largest yield of grain per acre. None of these varieties, however, have given nearly so many bushels per acre as the Mandscheuri variety of six-rowed barley. Perhaps the best known variety in Ontario

belonging to this class is the Black Hulless. This variety gives a good yield of grain which gives a heavy weight per measured bushel, but it usually possesses a very weak straw. The New White Hulless, regarding which so much has been said of late, possesses a stiffer straw than the Black Hulless variety, but is a much lighter yielder of grain.

Varieties of Spring Wheat.

Even though spring wheat is not grown in some sections of the Province, it must be remembered that in others it forms one of the regular crops of the rotation ; and in those sections where it is grown most largely it is important to secure those varieties which prove to be the most reliable for the average season. We have had about one hundred and forty varieties of spring wheat under experiment at the College within the past thirteen years. In the average results of the experiments for several years in succession, we have found that the "Wild Goose" has given decidedly the largest yield of grain per acre among all the varieties which we have grown. This variety produces very hard grain of coarse quality, which is difficult to grind. Both the flour and the bread made from Goose wheat, although of good quality, has a yellowish appearance. As it is a desirable variety, however, for the manufacture of macaroni, there has been a considerable demand in Italy and France for the Wild Goose wheat within the past five years. It is estimated that nearly 90 per cent. of the Wild Goose spring wheat which is shipped from Canada is used for the manufacture of macaroni. Our keenest competitors in the supply of macaroni wheat are Russia, India and Turkey, and the price for Ontario Wild Goose wheat will likely vary somewhat from year to year, owing to the production in the other countries. In order to keep up our reputation and to hold this good market for the Goose wheat, it is of the utmost importance that the variety be kept strictly pure. There is nothing that is likely to injure the export trade of the Goose wheat so much as the impurity of the sample. The grain should be kept free, not only from fall and spring wheat, but also from oats and barley. While it is important for the farmers to grow the Wild Goose wheat free from other varieties, it is of just as great importance that the exporters do not mix the soft wheats with the Wild Goose variety, even though the price of the Wild Goose wheat is a few cents higher per bushel than the softer wheats at the time when the wheat is being exported. Other varieties of macaroni wheats which we have grown are Medeah, Bart Tremenia, Sorentina, and Algiers. Each of these varieties has given better results than any of the finer varieties of spring wheat ; but none of them equals Wild Goose in yield of grain per acre. The Red Fife, Herison Bearded, Wellman Fife, and Red Fern are some of the best of the finer qualities of wheat according to the average results of several years' experiments.

Varieties of Winter Wheat.

Upwards of one hundred and sixty-five varieties of winter wheat have been grown at the College within the past fourteen years. These include the Canadian varieties and also those imported from Germany, Russia, France, England, Scotland, Australia and the United States. The results as to strength of straw, weight per measured bushel, and yield of grain per acre of a few varieties which are at present occupying the attention of many of the wheat-growing farmers of Ontario, are herewith presented.

	Per cent. of crop Lodged. Av. 6 yrs.	Lbs. per Bush. Av. 6 yrs.	Bushels per acre. (60 lbs.) Av. 6 yrs.
1. Dawson's Golden Chaff (white)	14.5	60.0	54.1
2. Imperial Amber	29 2	60.7	51.5
3. Egyptian Amber	32.5	61.2	50.1
4. Early Genesee Giant (white)	14 3	60.1	49.7
5. Buda Pesth (red)	60.0	61.1	49 6
6. Michigan Amber	28.3	60.9	49.3
7. Turkey Red	38.0	61.5	40.6
8. Treadwell (white)	10.8	60.6	39.1

Note.—The results in the foregoing table represent the work of six years in each case, with the exception of Buda Pesth, which has been tested for four years only.

In the autumn of 1900, exactly one hundred varieties of winter wheat were sown in our experimental grounds. In the spring of the present year, these were all examined to ascertain the comparative resistance of the different varieties to the attacks of the Hessian fly. The fly was found in twenty-four of the varieties, the greatest amount being found in the following kinds: Rudy, Mealy, Murray's Hybrid, Longberry No. 1, Genesee Reliable, Bearded Winter Fife, American Bronze, Wemide, Dawson's Golden Chaff, Geneva, and Pride of America. These were injured in the order here given, the Rudy variety being injured the most. The following varieties were practically free from the Hessian fly in the spring of the year: Imperial Amber, Egyptian Amber, Early Genesee Giant, Michigan Amber, etc. Even these varieties, however, showed slight injury later in the season. The Turkey Red wheat which was grown in Ontario for eight years showed but little injury from the fly, but the Turkey Red which was imported from Kansas in 1900 was considerably affected. For a more thorough study of this question several experiments with winter wheat are now in progress. For fuller information on the Hessian fly, the reader is referred to a bulletin on this subject prepared within the past year by Prof. Lochhead. Copies of this bulletin can be obtained by applying to the Department of Agriculture, Toronto, Ontario.

The susceptibility to rust is somewhat different with the different varieties of winter wheat. In studying this point very carefully with each of forty varieties for five years in succession, it has been found that the following kinds contained the least amount of rust: Bissell, Geneva, Turkey Red, Emporium, Amherst Isle, Imperial Amber, Reliable, Arnold's Hybrid, Red May and McPherson; and that the following kinds contained the greatest amount of rust: American Bronze, Helena, Silver Star, Early Genesee Giant, Early Red Clawson, and Red Velvet Chaff. The American Bronze had fifty per cent. more rust than Dawson's Golden Chaff, and Dawson's Golden Chaff had fifty per cent. more rust than the Michigan Amber.

The average of several years' results from seeding at different dates shows that the grain which was sown on or before the 9th of September, gave a considerably larger yield of both straw and grain than that which was sown after that date. The very best yields were obtained from the wheat which was sown the first week in September.

In each of seven years, an experiment has been conducted in duplicate by sowing winter wheat broadcast and with a drill. The results from sowing the same quantities of seed by the two methods are very similar, the yields per acre being practically equal. It should be understood that, in every case, the land was in a good state of cultivation when the seeding took place. In addition to this, an experiment was started with sowing an equal quantity of seed with the seed drill, half of it being sown the one way on the plot, and the remaining half being sown cross-wise on the same plot. This method of sowing, known as "Cross-drilled," gave slightly better results this year than the common drilling; but as this is the first year the experiment has been conducted, the results will not be published until they have been confirmed by further tests.

In order to find out the influence of cutting wheat at different stages of maturity upon the quality of the grain for seed purposes, samples were taken from the crop cut at different dates, and these samples were carefully sown upon separate plots. In the average results of these tests made with two varieties in each of six years, it was found that the heaviest weight of grain per measured bushel, and the largest yield of grain and straw per acre, were produced from seed taken from the crop which had been allowed to become very ripe before it was cut.

Varieties of Rye.

Although rye is grown in Germany much more extensively than wheat, we find that in Ontario only about 140,000 acres are devoted to this crop annually. Five varieties of winter rye have been grown in our experimental grounds within the past ten years. Two of these varieties, however, were dropped from our experiments in 1895. In the average results for several years, we find that the Mammoth Winter Rye has given us the largest yield of grain per acre. Not only does this hold true in the average results for several years, but it also holds true in the experiments of 1901. The Mammoth Winter

rye surpassed the common rye in yield of grain per acre by five bushels in 1898, one and a half bushels in 1900, and fourteen bushels in 1901. In the average yield of straw, both the Mammoth Winter rye and the Common rye produced upwards of four tons per acre.

Four varieties of spring rye were grown in our experimental plots in 1901 with the following results in yield of grain per acre: Dakota Mammoth, 38 3 bus; Prolific Spring, 33.3 bus.; Common, 32 6 bus.; and Colorado Giant, 15.6 bushels. In the average yield of grain per acre for four years, these varieties gave the following results: Dakota Mammoth, 41.8 bus.; Prolific Spring, 37 6 bus; Common, 35.0 bus.; and Colorado Giant, 25 bushels. In the average yield of straw for the same period, all the varieties, except the one last named, produced practically two and a half tons per acre. It will thus be seen that winter rye produces larger yields of both grain and straw per acre than the spring varieties.

Varieties of Buckwheat.

Three varieties of buckwheat have been grown in the experimental grounds for six years in succession, and in the average results of those six years it is found that the Japanese has given 20.3 bushels; the Silver Hull, 16 bushels; and the Common Grey, 13.8 bushels of grain per acre. In the production of straw, it is also found that the Japanese is the heaviest yielder, producing an average of 3 tons, while the Silver Hull produced 2.8 tons, and the Common Grey, 2 6 tons per acre. In the results for 1901, the Japanese gave a little over 23 bushels of grain per acre, which was about 4½ bushels more than the Silver Hull, and 9 bushels per acre more than the Common Grey variety.

Varieties of Field Peas

The common field pea is a leguminous plant and a native of Italy. It has been in cultivation many hundred years and is chiefly grown for its grain. It is also used in mixing with oats for the production of green fodder or of hay. For soiling purposes, it produces a large yield of very nutritious food. The seed is exceptionally rich and is of great value for using with other grain in fattening cattle and hogs. The straw is used extensively as a food for sheep, and is sometimes mixed with other coarse fodder for feeding to dairy cows. Field peas can be satisfactorily used in Ontario, as the Cow peas are used in the Southern States for plowing under as a green manure.

Upwards of one hundred varieties of peas have been grown in our experimental grounds within the past thirteen years. The greater number of these have been tested for at least five years in succession, after which time the poorer varieties have been dropped and the more successful kinds have been retained in the experiment. Not only have these varieties been tested for their productiveness, but they have also been examined very carefully during each of the past four years in order to find out those varieties which were least injured by the pea weevil (*Bruchus pisi*), perhaps more commonly known as the pea bug. The adult beetle deposits its yellow eggs on the outside of the young pod of the pea plant early in the summer. These hatch in a few days and the larvae bore through the pods into the peas where they eat a considerable portion of the interior of the peas. They remain inside the grain until they are fully grown. They sometimes emerge from the peas in the autumn and sometimes not until spring. As the pea weevils are becoming very numerous throughout the southern part of Ontario, great injury is done to the pea crop, and some farmers are giving up growing the common varieties of peas on this account. The accompanying table gives the average yields per acre of twenty-six of the leading varieties of peas grown in the experimental department for seven years in succession, and also gives the average percentage of weevilly peas in the experiments for four years.

Results of testing 26 varieties of Field Peas.

Varieties. (Arranged according to their average yield of grain per acre for seven years.)	Average percentage of peas containing weevils. (4 years.)	Average weight per measured bushel. (7 years.)	Average yield per acre. (7 years.)	
			Straw. (Tons.)	Grain. (Bush. 60lb.)
1. White Wonder	56	60 4	1.2	38.2
2. New Zealand Field	59	58 5	1.3	37 0
3. Early Britain	64	57 8	1.4	36.5
4. Egyptian Mummy	39	62.5	1.6	35.3
5. New Zealand Brown	61	56.8	1.5	34 4
6. Tall White Marrowfat	62	59.6	1 6	34.7
7. Potter	61	59 5	1.5	33.4
8. New Zealand Blue	59	59.7	1.1	32.9
9. Prussian Blue	50	60.0	1.7	31.8
10. White-Eyed Marrowfat	56	60.4	1.5	31.2
11. Common Grey	56	56.5	1.5	30.7
12. D'Auvergne	58	59.1	1.3	31.3
13. Chancellor	60	58.5	1.3	30.5
14. New Canadian Beauty	58	60.3	1 4	30.5
15. White Imperial	53	59.3	1 4	30.2
16. Improved Grey	70	56 9	1.4	32 2
17. Crown	58	58.0	1.4	28.9
18. Canada Cluster	48	61.0	1.5	29.3
19. Black-Eyed Marrowfat	64	59.5	1.4	27.1
20. Sword	57	59.6	1.6	27.1
21. Golden Vine	54	59.8	1.4	27.1
22. Centennial White	53	60.4	1.5	26 9
23. Multiplier	49	60.5	1.8	26.0
24. Prince Albert	49	60.9	1.7	25.1
25. Striped Wisconsin Blue	49	61.2	1.8	25.0
26. Coffee	53	57.8	1.5	23.6

It will be seen from an examination of the results here presented that there is a difference of over fourteen bushels per acre in the average yield of the highest as compared with the lowest variety in grain production The White Wonder, which stands at the head of the list in yield of grain, possesses a very short straw and is suitable only for land which is exceptionally rich The Early Britain, which comes third in the list in yield of grain per acre, possesses a much longer straw than that of the White Wonder. This variety has made the highest record in the co-operative experiments throughout Ontario during the four years in which it has been distributed. The peas of the Early Britain variety are brown in color and are, therefore, not so marketable a pea as some of the other varieties. In examining the column of figures representing the percentage of peas which were injured by the weevil, we find that only five varieties had less than 50 per cent. uninjured in the average results for four years. The Egyptian Mummy and the Canada Cluster were the freest in this respect. These two varieties are very similar in their habits of growth. It will be seen from the results here presented that all of these twenty-six varieties are liable to be greatly injured by the ravages of the pea weevil.

Weevil-Proof Peas.

None of the one hundred varieties of common peas which have been grown under experiment at the College have proven themselves to be proof against the ravages of the pea weevil (*Bruchus pisi*) so troublesome in the southern part of Ontario. There are other classes of peas, however, which differ considerably from the common varieties in their manner of growth and which have so far proven themselves to be weevil-proof. These are the Grass peas, Egyptian peas, and Cow peas

Grass Peas. The Grass pea produces straw of good length and of good quality, and the grain, which is angular in form, is very hard. In the average results of tests made with the Grass peas at the College for a period of seven years, it is found that the annual yield of grain has been 25.7 bushels per acre, and the yield of straw 2.2 tons. The grain is exceptionally heavy, the average weight per measured bushel for four years being a

little over sixty-four pounds. The results of the Grass pea tests have been given in a number of our annual reports since 1889, and this pea is now being grown quite extensively in some parts of Ontario where the pea weevil is doing so much damage to the common varieties of peas.

EGYPTIAN PEAS. The Egyptian pea is a leguminous plant grown extensively in the Mediterranean regions and in Central Asia. It has many common names, such as Coffee pea, Chick pea, Idaho pea, etc., and is known to botanists by the scientific name of *Cicer arietinum.* It has been used as feed for cattle and also as an article of human food for upwards of three thousand years. The seed is somewhat larger than that of the common pea and is enclosed in a short, thick, hairy pod, there being from one to two peas in each pod. The plant itself is seldom used except as a soil renovator, but the yield of grain is large and is ground into meal, which makes a very valuable cattle food when fed in much the same way as cotton seed meal. As a human food, the peas are used in various ways. The ripened grain is sometimes prepared for the table in much the same way that we prepare our Canadian beans for culinary purposes. Egyptian peas are sometimes roasted and used as a substitute for coffee. We have had the Egyptian pea under experiment since the spring of 1893. The crops of 1897 and 1898, however, were injured, and the results for these years are of no value. The average results for seven years are as follows: Yield of grain per acre, 35.6 bushels; yield of straw per acre, one ton; and weight of grain per measured bushel, 62.1 pounds. The Egyptian pea is rather slow in reaching maturity, and as it is short in the vine it requires good strong soil in order to obtain a satisfactory crop. This variety seems to be very well adapted to soils which usually cause the ordinary varieties of peas to produce too much straw that is apt to mildew.

COW PEAS. Nearly all the varieties of Cow peas require such a long season of growth that they are suited only to the warm climate of the South. A few of the earlier kinds have been grown in the Northern States, and have been tested at our experiment station at Guelph. We have as yet, however, been unable to find any variety of Cow peas upon which we can depend for the production of ripened grain, as our season is short, and it is only in exceptional years that even the earliest varieties of Cow peas will mature in Ontario.

VARIETIES OF FIELD BEANS.

Twenty-nine varieties of field beans have been grown in the experimental grounds for five years in succession. Each of nine of these varieties produced an average of upwards of 20 bushels per acre. Those giving the largest average yields for the five years are the following: Day's Improved Leafless, 22.3 bus.; White Wonder, 23 0 bus.; Medium or Navy, 22.6 bus.; Burlingame Medium, 22.3 bus.; Pearce's Improved Tree, 22 2 bus.; Schofield Pea, 22.0 bus.; Snowflake, 21.1 bus.; and Boston Pea Bean, 20.8 bus. per acre. The small white field bean gave an average of 19 7 bushels, and the Marrowfat variety a little over 17 bushels per acre. The Large White Haricots, which are so popular in England, have given an average yield of only 13.4 bushels of grain per acre in the five years' experiments.

SOY, SOJA, OR JAPANESE BEANS.

The Soy bean is a leguminous plant, being similar to clover, peas, and our common beans in this respect. The plants are upright in growth, branching considerably, and usually contain a very large number of pods. The varieties of Soy beans are numerous, but many are late in maturing and are best suited to the warmer climates. There are some of the varieties, however, which are much earlier in maturing and are better adapted to the colder climates. About twenty years ago, Prof. Georgeson, then connected with the Agricultural College in the State of Kansas, imported from Japan fifteen varieties of the Soy beans, with which he conducted practical experiments on the Experimental Station grounds and found that five of the varieties gave good results. These five varieties were imported from Kansas some ten years ago for growing in our experimental plots. The Early Yellow Soy Bean has given decidedly the best results among the five varieties which we obtained from Kansas. The record of this variety has been satisfactory throughout, and the yield of grain per acre in 1901 was 25.3 bushels. When we realize that this grain when ground furnished a meal about equal in composition to cotton seed meal, we cannot

help but acknowledge that this variety furnishes a large amount of valuable food constituents. It has given good results in the co-operative experiments throughout Ontario, as well as in the trials at the College.

VETCHES FOR SEED.

The common vetches and the hairy vetches were both sown in 1900, and again in 1901, and allowed to ripen for seed. As the Hairy vetches have been doing so well as a fodder crop, and as the seed is very expensive, it is desirable to glean information regarding the possibilities of producing seed of the Hairy vetch in Ontario Although the growing crop of both varieties was good in each of the two years, the seed production was not satisfactory from the spring sowings. The Hairy vetches ripened very unevenly. The yield of Hairy vetches was slightly better than that of the Common vetches in each of the two years. In the autumn of 1900, a plot of rich land which was in a somewhat sheltered place, was sown with the seed of Hairy vetches. The crop came through the winter well and produced upwards of 8 bushels of seed per acre in the summer of 1901. This is not a very large yield of seed, but when it is realized that the seed has been selling at from five to seven dollars per bushel, the returns would be great even from the amount of crop which was obtained.

VARIETIES OF FLAX.

Three varieties of flax have been grown in our experimental grounds for five years. The varieties under experiment have been the Manitoba, Russian, and the Common, and the results have been fairly uniform for the three varieties. In the spring of the present year, a small quantity of seed of the East India White variety of flax was obtained and sown in our plots. As the amount of seed was so small, we are unable to give any comparative results, but find this variety to be entirely distinct from the others and to be very early.

VARIETIES OF MILLET FOR SEED.

In each of the years 1894, 1898, 1899, 1900, and 1901, different varieties of millet were allowed to ripen to ascertain the comparative results of the different varieties in yield of seed per acre. The California variety of millet gave the largest yield of seed per acre in 1894, the second largest in 1898, the third largest in 1899, the second largest in 1900, and the fifth largest in 1901. Taking the average of the four years, the California variety gave 40.4 bushels per acre as compared with 36.4 bushels as the average yield of the Hungarian Grass. The Japanese Panicle millet, which has produced the largest yield of green fodder per acre of all the varieties of millet under experiment, gave 23.8 bushels of seed per acre in 1898, 31.3 bushels per acre in 1900, and 40 4 bushels per acre in 1901. In the average of five years' experiments, the common millet produced 21.1 bushels of seed per acre, which is only about one-half the yield of that produced by the most prolific variety.

VARIETIES OF CORN FOR GRAIN.

In past years, the results of the dent, flint, and sweet varieties of corn have all been given together, and the results in total yield per acre, yield of ears per acre, comparative earliness of the different varieties, etc., have been presented in the report under one heading. In 1900, and again in 1901, after the ears were husked and weighed in the fall, those of the earlier varieties were taken to the experimental building and allowed to dry, after which they were shelled and the yield of grain of each variety ascertained. Of the twenty-eight varieties which were treated in this way in each of the two years, we find that the largest average yields of grain per acre were produced by the following varieties: Hathaway's Yellow Dent, Great Western, North Star Yellow Dent, King Phillip, Genesee Valley, Keil's Early Dent, Pride of Canada, Salzer's South Dakota, and Angel of Midnight. Each of the varieties here mentioned produced an average of over 60 bushels of shelled grain per acre.

Varieties of Sorghum for the Production of Seed.

Sugar Cane. The first experiment in which we attempted to ascertain the amount of seed which could be obtained from different varieties of sugar cane was conducted in our experimental grounds in 1900 and was repeated in 1901. In each year five varieties were used. The seed was planted about 27 inches apart each way, there being six seeds planted in each place. Only three plants, however, were allowed to remain in each hill after the growth had become nicely started. This method was adopted in order that a complete stand of plants might be secured. The land was kept on the level and was cultivated similarly to that producing a crop of corn. All varieties were allowed to remain as late as the season would permit before they were cut. As the seed of the sugar cane is produced at the top of the plants, the heads were removed, and after being allowed to dry were threshed. The Fodder Cane produced the largest yield of seed per acre in each of the two years, *i.e.*, 20.8 bushels in 1900 and 24.2 bushels in 1901, and the Early Minnesota Sugar Cane came second in each of the two years, with a yield of 19.9 in 1900 and of 15 7 in 1901. It will thus be seen that some of the varieties of sugar cane will produce a good deal of seed per acre in Ontario, provided the season is favorable.

Broom Corn. The information regarding date of seeding, method of cultivation, etc., which is given in the item on sugar cane will apply equally well to the broom corn. Four varieties in all were planted in the spring of 1900 and again in 1901. Taking the average for the two years, the Early Japanese Broom Corn produced the largest yield of seed, 30.8 bushels, and the Improved Evergreen variety came second with a yield of 29.5 bushels per acre. The Dwarf variety of broom corn gave an average of only 5 3 bushels per acre in 1900 and 7 3 bushels per acre in 1901. It will thus be seen that there is a great difference in the relative amount of seed produced by the different varieties of broom corn.

Other Sorghums. Besides the different varieties of sugar cane and broom corn, a number of other varieties of sorghum were grown under uniform conditions with varying results in seed production. In this class the Brown Dhoura corn gave the greatest yield of seed per acre in each of the two years, the yield in 1900 being 14.3 bushels and in 1901 17.2 bushels. A few of the varieties gave less than one bushel of seed per acre in each of the past two years.

Varieties of Sunflowers for Seed Production.

Three varieties of sunflowers have been grown in the experimental department and the yield of seed determined in each of four years. Taking 20 pounds as the standard weight of sunflower seed, we find the average yield of seed for the four years produced by the Mammoth Russian was 64.8 bushels, by the White Beauty 62.7 bushels and by the Black Giant 55.0 bushels. It will be seen that each of these varieties produced very large yields.

Varieties of Potatoes.

A great deal of attention has been devoted to testing potatoes at our Experiment Station within the past few years. Fully twenty-five distinct experiments have been carried on with different methods of preparing seed, different systems of cultivation, application of commercial fertilizers, etc. The results of many of these experiments have been given in my annual reports from year to year, to which the reader is referred. Besides the experiments here referred to, upwards of two hundred varieties of potatoes have been grown under uniform conditions in our experimental grounds within the past ten years. A number of these varieties which proved the least successful were dropped from our lists previous to the spring of the present year. In 1901, the number of varieties under experiment was one hundred and three. All the varieties were planted on the 23rd of May in rows 3½ links (26⅝ inches) apart. The cut potatoes were planted one foot apart in the rows, and only one piece was planted in each place. The seed was placed about four inches below the level of the soil, and level cultivation was carried on during the summer.

In the results for the past year, it was found that each of thirty varieties gave upwards of 300 bushels of potatoes per acre, and that each of six varieties gave a yield of less than 200 bushels per acre. The largest yields in 1901 were produced by the fol-

lowing varieties : Sunlit Star, American Wonder, the Daisy, Pearl of Savoy, and Rural Blush. The Empire State variety, which has made a high record in the average results for eight years, is not included in the five highest yielding varieties this year, but follows closely after with a yield of 327 bushels per acre. In taking the average results of a large number of varieties of potatoes grown for a series of years, it is found that the Empire State, Pearl of Savoy, American Wonder, Dempsey's Seedling, and Rural New Yorker No. 2 are among the best as general croppers. For exceedingly early use, the Stray Beauty, Howe's Premium, and Early Ohio have given the largest yields per acre at nine weeks after planting in the results for 1901, and also in the average results for six years. Although the Stray Beauty is an exceedingly early potato, it is not recommended for cultivation, except for very early use, as later in the season other varieties will surpass it in quality.

Selection of Seed Potatoes.

The results of several experiments conducted at the College within the past few years show that the size of the potatoes, or the size of the pieces planted, has a marked influence upon the crop produced. Large potatoes or large pieces produce greater yields than small potatoes or small pieces. It has been found that large potatoes cut into pieces of about 2 ounces in weight gave very satisfactory results, when the amount of seed used as well as the yield of potatoes produced were both taken into consideration.

Number of Potato Sets to Plant in Each Hill.

As the result of an experiment conducted for three years in succession, in planting one, two, and four pieces of potatoes in the same place, and by using the same weight of seed in every case, it has been found that larger yields and better satisfaction have been obtained where only one piece was planted in each place. The cutting of a potato tends to increase the number of stems produced, and when from two to four small potato sets are planted in one place there is a greater number of stems produced than when one large piece is used. A few, large, vigorous stems appear to give better results in both yield and quality of potatoes than a large number of small weakly stems.

Length of Time to Cut Potatoes Before Planting.

An experiment has been conducted for seven years in succession in cutting potatoes and planting them on the same day, as compared with cutting potatoes from four to five days previous to planting. It has been found that the potatoes which were cut and planted on the same day gave upwards of six bushels per acre per annum more than those which were cut and allowed to remain a few days before they were planted. Both the experiments at the College and the co-operative experiments throughout Ontario demonstrate very clearly the great importance of planting potatoes immediately after they are cut.

Remedies for the Potato Beetle.

For six years in succession an experiment has been carried on in our trial grounds by treating potatoes differently for the destruction of the potato beetle. The treatments used were : Paris green with water, Paris green with plaster, and a preparation known as Potato-Bug Finish. These were used from two to four times in each season. As a basis of comparison one plot in every test was allowed to remain untreated. The average results of the experiments for the six years go to show that the potatoes which were not treated produced an annual yield of 76 bushels per acre ; those treated with Potato-Bug Finish, 120 bushels per acre ; with Paris green and plaster, 125 bushels per acre ; and Paris green in water, 135 bushels per acre. In four out of five years, the Paris green and water gave the best results, and in one year the Paris green and plaster gave the best satisfaction. In no instance did the potatoes which were treated with the Potato-Bug Finish give as large a yield of tubers per acre as those treated with the Paris green in ution.

Field Roots.

The root crop occupies an important place in a rotation, furnishes an excellent means for cleaning the land, prepares a splendid seed bed for a cereal crop, and supplies a large amount of succulent and palatable winter fodder, which is rich in food constituents and is easily digested by the animals In many localities, however, the corn crop is taking the place of roots to a considerable extent as a stock food. This, of course, applies more to the southern part than to the northern part of the Province, owing to the fact that corn requires a much greater amount of heat and sunshine for its perfect development than does any one class of the root crops. For the benefit of those who grow roots as a stock food, we hereby submit very brief notes upon the results of experiments conducted at the College, both with varieties of roots, and with various methods of cultivation.

Varieties of Field Roots.

Several hundred varieties of roots have been grown in the Experimental Department within the past ten years, and the majority of them have now been under test for at least five years in succession. The following are some of the largest yielding varieties :— *Long Red Mangolds*—Evans' Improved Mammoth Sawlog, Simmers' Improved Mammoth Long Red, and Steele-Briggs' Long Red Selected ; *Intermediate Mangels*—Carter's Champion Yellow ; *Globe Mangels*—Carter's Warden Yellow ; *Swede Turnips*—Hartley's Bronze Top, Kangaroo, and Sutton's Magnum Bonum ; *Fall Turnips*—Cow Horn and Jersey Navet ; *Carrots*—Mammoth Intermediate Smooth, Improved Short White, and Improved Half Long White.

Selection of Root Seed.

An experiment has been conducted by sowing different selections of seed for five years in succession with mangels and carrots ; four years in succession with Swedish turnips ; and five years in succession with sugar beets and fall turnips. In each of these years, the large plump seed, medium sized seed, and small sized seed was taken from good average seed purchased from leading seedsmen. In selecting the seed, great care was taken to use nothing but what was apparently sound in every respect.

Selections.	Yield of roots per acre.					
	Mangels ; average, 5 years.	Carrots ; average, 5 years.	Sugar Beets ; average, 3 years.	Swede Turnips ; average, 4 years.	Fall Turnips ; average, 3 years.	Average yield per acre of all classes of roots.
Large plump seed	33.19	24.47	20.32	13.97	22.79	22.95
Medium sized seed..............	29.62	22.23	19.79	12.39	19.45	20.70
Small sized seed.....................	21.52	16.23	14.45	5.66	11.97	13.97

The results here presented are the averages of the crops produced from the different selections. The results are certainly very interesting. There are but few growers of roots who ever think of sifting the seed or trying in any way to improve the seed purchased. As none but apparently perfectly sound seed was used for this experiment, the results indicate that much better returns could be obtained in ordinary farm practice by carefully separating the large from the small seed and discarding the latter. In the average results of all the classes of roots for the number of years during which the experiment has been conducted, it will be seen that the large plump seed gave fully 2 tons per acre more than the medium sized seed, and 9 tons per acre more than the small sized seed. The greatest comparative difference resulting from the selection of seed is shown by Swede turnips, and the least comparative difference by the sugar beets and mangels. We believe that a great mistake is sometimes made by root growers in trying to purchase seed at a low price without much regard to the size or quality of the seed.

Planting Root Seed at Different Depths.

For several years in succession, we have sown root seed at different depths in the soil, in order to ascertain the depth at which we might expect to obtain the best results throughout a series of years. The experiments have been conducted on comparatively low land, and also upon land of considerable elevation The soil has been what might be termed an average clay loam, and in no instance was it very light or very heavy. The experiment has been repeated for four years with mangels, sugar beets, and Swede turnips; for three years with carrots; and for two years with fall turnips. The cultivation has been on the level throughout. The seed of each of the classes of roots in each of these years was planted one-half inch, one inch, one and a half inches, two inches, three inches, and four inches below the surface of the ground. The average results, up to the present time, show that mangels, sugar beets, Swede turnips, and carrots gave the best results from placing the seed at a depth of one-half inch, and fall turnips at a depth of one and a half inches. Taking the average of all the experiments made with the various classes of roots, we find that the seed which was planted only one-half inch deep gave the largest yield per acre, and as the depth of planting the seed increased, the yield per acre decreased. The mangel seed which was sown at the depth of one-half inch gave an average yield of 23.9 tons per acre, and that sown at the depth of one inch gave 16.3 tons per acre. The sugar beet seed, which was sown only one-half inch deep, gave about four tons per acre more than that which was sown to a depth of one inch. This experiment indicates, that on soil similar to that on which this experiment was conducted, root seed should be sown quite close to the surface, and more particularly is this important in the case of mangel and sugar beet seed.

Roots Grown on the Flat and on Ridges.

An experiment has been conducted for five years in succession with carrots, and for six years in succession with mangels, Swede turnips, and fall turnips in order to compare the results from sowing the seed on ridges, as has been the usual custom throughout Ontario, with the sowing the seed on the level. The experiment with each class of roots was conducted in duplicate each year, thus making a total of forty-six separate tests. The experiment was conducted in different portions of the experimental grounds, and upon land of different elevations. The soil was not specially heavy or specially light, but what might be termed an average clay loam. The ridges used were made to a height of about three inches. Taking the average of all the tests made with all the classes of roots, it is found that the land which was cultivated on the flat produced between four and five bushels per acre more than the land which was ridged before the roots were sown.

Thinning Plants of Field Roots at Different Stages of Growth.

For no less than five years, an experiment has been conducted with mangels, carrots, swede turnips, and fall turnips, by thinning the plants when they were only from $1\frac{1}{2}$ to 2 inches in height, and thinning the plants when they were from 8 to 10 inches in height. The experiment with each class of roots was conducted in duplicate each year. The average results of the mangels, Swede turnips, and fall turnips are decidedly in favor of the early thinning, while those of the carrots slightly favor the later thinning. In taking the average of all the results, we find that early thinning gave $1\frac{3}{4}$ tons of roots per acre more than the later thinning.

Varieties of Sugar Beets for Agricultural Purposes.

Owing to both the good feeding and the good keeping qualities of sugar beets, a number of Ontario farmers are now growing sugar beets as a stock food. From an agricultural standpoint, fully twenty varieties of sugar beets have been grown in the experimental grounds at the college. Seed has been obtained from different sources under eight different names, and has been sown in plots side by side for eight years in succession. A few of these varieties are very similar in appearance, while others are quite different in their characteristics. The following list gives the average number of tons per acre of the eight varieties of sugar beets grown in the experimental grounds for eight years:

Lane's Improved	18.8 tons	White French	16.1 tons
Red Top	18.8 "	Red Skinned	15.6 "
White Silesian	18 4 "	Kleinwanzlebener	15.4 "
Champion	18.1 "	Improved Imperial	13.4 "

For six years in succession, three other varieties have been grown under uniform conditions with those already mentioned. The average yield per acre for the six years of each of these varieties is as follows : New Danish Improved 19.9 tons ; Jersey, 18.2 tons ; and French Yellow, 16 9 tons.

In 1901 twenty-two varieties of sugar beets were grown in the experimental grounds for agricultural purposes. Besides the tests made with these varieties, several tests were made with the Kleinwanzlebener sugar beet, the seed of which was obtained from different sources, some of the seed being imported in the spring of 1901 and the rest in the spring of 1900. All these were tested on land which produced winter wheat in 1900. Soon after the winter wheat was removed from the field, the land was plowed to a depth of about three inches. Late in the autumn the land was plowed to a depth of fully six inches. In the spring of the present year, farm-yard manure at the rate of twenty tons per acre was applied to the land, and the subsoil was stirred to a depth of about ten inches by means of a grubber. On the 15th of May seed was sown in rows 3½ links (26 2-5 inches) apart. When the plants were from one and one-half to two inches in height they were thinned to one link (7.9 inches) apart. Level cultivation was used throughout.

The following table gives the results of the different varieties of sugar beets in connection with the experiments here outlined.

Varieties of Sugar Beets for Feeding Purposes.

Varieties.	Yield of Roots per Acre (tons). 1900.	1901.	Average Two Years.
1. Red Top	24.45	19.63	22.04
2. Red Skinned	21.55	20.60	21.08
3. White Silesian	21.45	18.15	19.80
4. New Danish Improved	19.10	18.60	18.85
5. Green Top White	18.35	18.91	18.63
6. Lane's Improved	20.45	16.28	18.37
7. Champion	19.25	17.18	18.22
8. Royal Giant	14.95	19.29	17.12
9. Giant Red Half-Sugar	14.50	17.67	16.09
10. White French	17.35	14.39	15.87
11. Giant White Half-Sugar	14.05	17.22	15.64
12. Pitzscheke's Elite	14 85	14.61	14.73
13. Jersey	13.70	14.63	14.17
14. French Yellow	13.15	15.14	14.15
15. Carter's Nursery	13.35	14.93	14.14
16. Improved Imperial	14.00	14.22	14.11
17. Imperial Grey Top	11.85	15.87	13.86
18. Queen of the Danes	11.65	12.63	12.14
19. Vilmorin's Improved*	12.55	9.73	11.14
20. Kleinwanzebener (seed from Wiarton, Ont., 1900)	.....	16.81	.....
21. Kleinwanzebener (seed from Caro, Mich, 1901)	.....	14.59	.....
22. Kleinwanzebener (seed from Scranton, Pa., 1900	.....	14.24	.....
23. Kleinwanzebener (seed from Aylmer, Ont., 1900	.....	13.74	.....
24. Vilmorin's French Sugar	.....	13.22	.....
25. Mangel Sugar Beet	.....	13.01	.....

At our request, the Chemical Department analysed averaged samples of the different varieties of sugar beets grown in the Experimental Department in 1900, and also in

* The Vilmorin's Improved had only 80 per cent. of the required number of roots in the test of 1901.

1901. The results of the chemical analyses will be found in the report of the Chemical Department written by Prof. Harcourt in this volume. (See page 37.)

From the results here presented, it will be seen that the varieties of sugar beets specially noted for their high percentage of sugar, such as the Kleinwanzlebener, Vilmorin's Improved, and Pitzscheke's Elite, are not as large yielders as some of the varieties recognized for agricultural purposes. It must be understood, however, that some of the larger yielding varieties do not contain as much sugar as others which produce a smaller yield. The yields per acre here presented could be studied in conjunction with the chemical analyses, as presented in Prof. Harcourt's report in this volume.

In the average of two years' experiments, it is found that the following varieties produced roots which grew out of the ground on an average of from three to five inches, *i. e.*, Royal Giant, 5 ins. ; Giant White Half Sugar, 3 4-5 ins. ; Giant Red Half Sugar, 3 7-10 ins. ; Red Skinned, 3 3-5 ins. ; Lane's Improved, 3 1-10 ins. ; Red Top, 3 ins. ; and Champion, 3 ins. The roots of some of the varieties grew out of the ground less than one inch in the average of the crop in the two years past, *i. e.*, Kleinwanzlebener, 4-5 inch ; Pitzscheke's Elite, 4-5 inch ; Carter's Nursery, 9-10 inch ; and Improved Imperial, 19-20 of an inch. In nearly all cases, those varieties which grow with a considerable portion of their root out of the ground are the easiest to harvest, but those which grow under the ground are the richest in sugar.

Varieties of Fodder Corn.

One hundred and thirty-eight varieties of corn where grown in the experimental department in 1901. These varieties belong to the three general classes of corn, *i. e.*, flint, dent, and sweet. Of all the varieties which have been grown for several years in succession, we find that the Mammoth Cuban and the Mastadon Dent are varieties which give excellent satisfaction on the warm soils of Southern Ontario, where large varieties of corn can be grown successfully ; that the Wisconsin Earliest White Dent gives a good yield of total crop per acre which is of excellent quality, this variety producing the largest yield of ears per acre among sixty seven varieties grown for five years in succession, and is well suited to the central part of Ontario where the frosts are not too severe; that the three flint varieties, Salzer's North Dakota, Compton's Early and King Phillip, and one dent variety, North Star Yellow Dent, have given good results and are well suited for the central and southern part of Ontario.

Depth of Planting Corn.

For three years in succession, corn has been planted $\frac{1}{2}$ inch, 1 inch, 1 $\frac{1}{2}$ inches, 2 inches, 3 inches, and 4 inches deep. The planting took place each year in the latter part of May. The experiment was conducted in duplicate each season. The corn which was planted 2 inches deep gave the largest yields of total crop per acre in each of the years 1900 and 1901, and the second largest yield per acre in 1899. Taking the average of the three years experiments, the planting at a depth of 2 inches gave the highest yield of total crop per acre.

Different Mixtures of Peas and Oats for Green Fodder.

For five years in succession different varieties of peas and oats have been sown in mixtures for the production of green fodder. A very careful selection has been made, with the object of securing a crop that would come early in the season ; and another that would come somewhat later ; and another that would come still later. This experiment was conducted in duplicate in each of the five years. The seedings of the different mixtures all took place at the same time in each year, and the crops were harvested when in about the right stage of maturity to be used as green fodder, the peas being nearly full size and the oats in the milk condition. The average results for the five years of each mixture are as follows : *Early varieties*—Daubeney oats and Chancellor peas, 5.9 tons of green crop ; *Medium early varieties*—Siberian oats and Prussian Blue peas, 6.9 tons of green crop ; and *Late varieties*—Mammoth Cluster oats and Prince Albert peas, 6.1 tons of green crop per acre. In the average of the five years' experiments, the early varieties were cut 70 days after seeding, the medium early varieties 77 days after seeding,

and the late varieties 84 days after seeding took place. These six varieties were used in the experiment throughout, with the exception that for the late mixture Golden Giant oats and Oakshott peas were the varieties used in the early experiments, and the Mammoth Cluster oats and Prince Albert peas formed the mixture in the later experiments. As there is a period of exactly two weeks from the time the earlier varieties were ready to harvest until the later varieties reached the same condition, it will be seen that by using suitable mixtures the farmer can take his seed and mixtures into the field and sow two or three different mixtures at the same time, and thus increase the feeding period by two weeks, simply from the use of varieties which require periods of different lengths for the production of green fodder of the right quality. Taking all the experiments into consideration, we have found that a mixture of two bushels of Siberian oats and one bushel of Prussian Blue peas per acre makes an admirable seeding for the production of either green or dry fodder.

Varieties of Sorghum for Green Fodder.

There are a large number of varieties of sorghum which are quite distinct in many characteristics. Some are used principally for the production of syrup; others for furnishing material for the manufacture of brooms and whisks; others almost entirely for the production of food for culinary purposes, etc All of the varieties, however, are more or less valuable as producers of food for farm animals. Both in the United States and Canada, a good deal has been said and much has been written of late regarding the value of sorghum as an economical plant for the production of valuable food to be used as a pasture, a green fodder, or a dry fodder crop, or for the production of silage. In 1900, and also in 1901, the seed of the principal kinds of sorghum was collected and sown in the trial grounds for experimental purposes in each of the two years The seed was planted in squares by placing about 5 seeds in a place, and allowing $3\frac{1}{3}$ links (26 2/5 inches) between the different plantings. When the sorghum was about five inches in height, some of the plants were removed, allowing three to remain in each place. The sorghum was cultivated in about the same way that corn is usually cultivated. All the varieties were cut in October before being injured by frost. The following list gives the yield of green crop per acre and the percentage of the whole crop, which is in the form of leaf, as determined from the average results of the experiments of 1900 and 1901:

	Varieties.	2 years. Per cent. Leaf to Stem.	2 years. Tons of Green Crop per acre.
1	Orange Sugar Cane	32.86	18.09
2	Early Minnesota Sugar Cane	15.29	16.38
3	White Kaffir Corn	36.09	14.59
4	Kansas Orange Sugar Cane	31.78	14 13
5	Black Rice Corn	38.39	13.67
6	Fodder Cane	20.79	13.26
7	Early Amber Sugar Cane	15.90	12 28
8	Red Kaffir Corn	40.75	11.94
9	Yellow Millo Maize	35.02	10 98
10	California Golden Broom Corn	27.94	10.78
11	White Millo Maize	41.16	8.57
12	Improved Evergreen Broom Corn	25.19	8.13
13	Brown Dhoura Corn	36.41	7.[illegible]9
14	Early Japanese Broom Corn	22.58	7.32
15	Dwarf Broom Corn	41.74	6.42
16	Jerusalem Corn	35.14	3.49

It will be seen from the results here presented that the largest yields per acre were produced by two varieties of sugar corn, and the lowest yields per acre by three varieties of broom corn. The Early Amber Sugar Cane, which is one of the best known varieties, stands seventh in the list in average yield of green crop per acre, giving fully five tons per acre less than the variety known as Orange Sugar Cane. In looking over the column of the percentage of leaf to stem, it will be seen that there is a very great variation, as, for instance, the Early Amber Sugar Cane has a very small amount of leaf and a large amount of stem, while the Dwarf Broom corn, the White Millo Maize, and the Red Kaffir Corn have forty per cent, as great a yield of leaf as stem.

Seven varieties of sorghum have been under experiment in each of seven years, and the average yield of green crop per acre of each variety for the seven years is as follows ; Orange Sugar cane, 16.9 tons ; Fodder cane, 15 2 tons ; Early Amber Sugar Cane, 14 5 tons ; California Golden Broom Corn, 11 tons ; Kaffir Corn, 10.9 tons ; Yellow Millo Maize, 9 4 tons ; and Jerusalem Corn 5.8. tons. Some of these varieties are much earlier than others, frequently producing full heads with matured seed The average yield of heads per acre of each variety for the seven years is as follows : California Broom Corn, 2 060 lbs. ; Jerusalem Corn, 1,400 lbs. ; Yellow Millo Maize, 1,240 lbs ; Early Amber Sugar Cane, 620 lbs. ; Fodder Cane, 520 lbs. ; Orange Sugar cane, 340 lbs. ; and Kaffir Corn, 280 lbs. The California Golden Broom Corn produced a large amount of heads of good quality.

Varieties of Kohl Rabi

Three varieties of Kohl Rabi have been grown in the Experimental Department for five years in succession This crop is sometimes grown for food for stock in some of the older countries. The root of the Kohl Rabi is somewhat like that of cabbage, while the leaves resemble the tops of swede turnips. The valuable part of the plant, however grows about three inches above the level of the ground in the form of a bulb Kohl Rabi makes a very nice food for domestic use, and is prepared for culinary purposes in much the same way as swede turnips. The seed of Kohl Rabi resembles very closely that of the swede and fall turnips, and the crop is grown in much the same manner as that of turnips.

The following is the average yield in tons per acre of each of the three varieties of Kohl Rabi grown in the experimental grounds for five years : Early White Vienna, 19 3 ; Earliest Erfurt, 16.5 ; and Purple Vienna, 16 2. Besides the three varieties which have been grown for five years, two others have been grown in each of the past two years and have produced the following average yields per acre for the two years : Goliath Purple, 15.9 tons, and Carter's Model 11.2 tons. In the crop for 1900, the Early White Vienna, Goliath Purple, Purple Vienna, Earliest Erfurt, and Carter's Model gave 20.7, 20 1, 15.6, 16 0, and 13.5 tons per acre in the order here given. It will be seen from these results that the Early White Vienna gave the largest yield per acre in 1901, and also in the average of five years.

Varieties of Rape.

There are several varieties of rape, such as the Dwarf Essex, Victoria, White Flowering, Umbrella, and German Summer Of these varieties, the Dwarf Essex and the Victoria are the most extensively advertised. We have had these two varieties grown under similar conditions in each of seven years The average results for the seven years show that the Dwarf Essex variety has produced 22.4 tons, and the Victoria 20 6 tons per acre. This shows the Dwarf Essex variety to have given one and four-fifths tons per acre more than the Victoria rape. There is no other variety of rape which has given nearly so good satisfaction as the Dwarf Essex The German Summer (bird-seed rape) should never be grown for agricultural purposes, as it seeds the same season as sown and is, therefore, a variety poor in feeding properties and difficult to eradicate. These points should be carefully observed, as serious trouble has sometimes resulted from sowing a large area of this variety.

Results from Sowing Different Selections of Rape Seed

From good average samples of commercial rape seed, large, medium, and small sized seeds have been selected for experimental purposes in each of five years. The seed in every instance was first separated by means of sieves of different sizes. After the seed was separated in this way, it was carefully hand-picked, and none but good, sound seed was used in every case. In each of the years, large seed was sown in one plot, medium sized seed in another plot, and small seed in another, and this was repeated once, twice, or three times, usually the latter. For this experiment, the seed was sown quite thickly, and after the plants were about two inches in height they were carefully thinned with the object of leaving the same number of plants in each plot, the object being to ascertain the comparative value of seeds of different sizes for crop production. In each of the years, the large seed produced the largest crop, and the small seed the smallest crop, except in 1896 when the medium sized seed and the small seed gave equal results. Taking

the average of the experiments conducted in the five years, we find that the number of tons of green rape per acre produced from each of the selections of seed were as follows: Large seed, 17.4 ; medium sized seed, 15.0 ; small seed, 12.4. These results are certainly very suggestive.

METHODS OF CULTIVATION FOR RAPE.

In six different years, an experiment has been conducted by sowing rape on land which had not been subsoiled as against sowing rape on land which had been previously subsoiled. The subsoiling was done in every case with an ordinary subsoil plow immediately before the rape was sown. The experiment was conducted in duplicate each year. The following are the average results for the six seasons: Land not subsoiled gave 15.81 tons of green rape per acre, and the land which was subsoiled gave an average of 15.77 tons of green rape per acre. This shows a difference of only 80 lbs. of rape per acre between the two methods, which plainly shows that on land on which this experiment was conducted there was no advantage from subsoiling the land immediately before the rape seed was sown. This experiment was conducted in different portions of the experimental grounds. The surface soil may be termed an average clay loam. The subsoil is naturally rather compact in the experimental grounds. Had this experiment been conducted on soil of a different character, or had the subsoiling been done the autumn before the time that the seed was sown, the results might have been somewhat different.

In each of nine years, an experiment has been carried on in the experimental grounds by sowing rape on the level or flat land, as compared with sowing rape on land which had previously been ridged with a double mould-board plow. The top of the ridges was about three inches higher than the bottom of the furrow between the ridges. The rows were $3\frac{1}{3}$ links (26 2/5 inches) apart in both methods of cultivation. The average number of tons of green rape per acre produced from the level cultivation was 13.2 tons, and that produced from the ridged cultivation was 13.9 tons, or a difference of a little over two-thirds of a ton of green rape per acre in favor of sowing on ridges. The results in the case of rape, therefore, are somewhat different from those of roots, which have usually given larger yields per acre on flat as compared with ridged land.

DEPTH OF PLANTING RAPE SEED.

For experimental purposes, rape seed has been sown one-half inch, one inch, one and one-half inches, two inches, three inches, and four inches deep in each of the past four years, in order to glean some information regarding the practical results from sowing seed at different depths throughout a number of seasons. This experiment has been conducted in duplicate in each of the four years. Great care has been taken to place the seeds at the exact depths below the surface. The following are the average results for the four years in tons of green rape per acre: One-half inch, 24.3 ; one inch, 18 3 ; one and one-half inches, 17.8 ; two inches, 17.8 ; three inches, 10.9, and four inches, 2.8. The results of this experiment, so far as has been conducted, seem to indicate that rape seed should not be placed in the soil, even to a depth of one inch. In 1898, the yield from planting one inch deep was about one ton per acre greater than from the planting of one-half inch in depth, but in each of the other three years the results were decidedly in favor of the shallow planting. As seasons vary so greatly in the amount of rainfall, and as it is impossible to know before hand just the kind of a season to expect, the average results for a number of years will form the best general guide in determining the best depth to sow rape seed. This experiment will likely be repeated in future years.

VARIETIES OF VETCHES.

For five years in succession, the Common Spring Vetch (*Vicia sativa*) and the Hairy Vetch (*Vicia vellosa*) have been grown under similar conditions in the Experimental Department in order to ascertain the comparative results of these two varieties in the production of green fodder. The Common Spring Vetch is familiar to many of the farmers of Ontario, especially to the dairymen who have used it for sowing with oats for the production of green fodder to supplement pastures during the dry part of the summer, or for making into hay for winter fodder. Common Vetches have been tested over a large part of the American Continent, but seem to be best adapted to Canada and to the North-Eastern States. The Hairy Vetch is not so well known in Canada as the Common variety, as it was originally obtained from Western Asia and has not yet come into gen-

eral cultivation in this Province. A great drawback in connection with the Hairy Vetch in Ontario is the high price at which the seed is sold. It may be possible, however, to obtain seed of this variety at a much less cost in the near future. From a crop of Hairy Vetches sown in the autumn of 1900, we obtained seed this year at the rate of about eight bushels per acre. The price at which the seed of the Hairy Vetch has been selling within the past year is about $6.00 per bushel.

In the average results of growing the two varieties of vetches for five years in succession, we find that the Hairy Vetch has produced 10.1 tons, and the Common Vetch 5.6 tons of green crop per acre per annum. Not only has the Hairy Vetch far surpassed the Common Vetch in yield per acre at the College, but the record has been very similar in the co-operative experiments with these varieties throughout Ontario. The Hairy Vetch seems to be very useful for either the production of green fodder to be cut and fed or pastured or as a cover crop on land planted with fruit trees.

Leguminous Crops for Green Fodder.

In the spring of the present year a large number of varieties of Cow Peas, Vetches, Soy Beans, etc., were planted under similar conditions for the production of green fodder. The season was more favorable than usual for the growth of some of these crops, and the Cow Peas did exceptionally well. The accompanying list gives the average height and the number of tons of green crop produced by each variety in the experiment.

	Varieties.	Average height inches.	Tons of green crop per acre. 1901.
1	Hairy Vetches	19	15.05
2	Black Cow Peas	22	14.05
3	Crimson Clover	13	13.30
4	Wonderful Cow Peas	26	12.23
5	Whip-poor-Will Cow Peas	23	12.00
6	New Era Cow Peas	22	11.55
7	Common Vetches	..	11.55
8	Taylor Cow Peas	20	11.25
9	Extra Early Blackeye Cow Peas	21	10.70
10	Warren's Extra Early Cow Peas	23½	9.50
11	Medium Green Soy Beans	40	9.10
12	Horse Beans	28½	8.55
13	Early Yellow Soy Beans	30	8.30
14	Prussian Blue Peas	30	6.85
15	American Coffee Berry	30	6.40
16	Grass Peas	25	6.30
17	Velvet Peas	20	5.75
18	Extra Early Dwarf Soy Beans	20	3.85

In reference to the past results of the Cow Peas, I quote the following from my report of 1899 :—" There are over one hundred named varieties of cow peas grown in the United States. Nearly all of these, however, require such a long season of growth that they are suited only to the warm climate of the South. A few of the earlier kinds have been grown in the Northern States, and have been tested at our Experimental Station at Guelph. One or more varieties have been sown in our experimental grounds during each of the past eight or nine years. It has been found, however, that nearly all varieties are too late for the climate of Ontario, unless it is in some instances for producing a green crop for plowing under. They seldom grow to a height of more than ten to twelve inches, although an average height of 25 inches was made by the Black-Eye variety of cow peas in 1899. The varieties which we have mostly grown are the Warren's Extra Early, Black-Eye. New Era and Whip-poor-Will. Of these varieties, the Whip-poor-will and the New Era proved to be the earliest. None of these varieties, however, have produced an average of more than about one and one-half tons of green crop per acre during each of the past two years. During the entire period in which we have had the cow peas under experiment, no grain has been produced until the present year, when the plants became sufficiently well matured to produce a crop of peas, which was, however, very light. The yield of the New Era was the largest, but it was

only a little over two bushels per acre. The Experiment Station will still be on the watch for some varieties of cow peas which will be sufficiently rapid in growth to prove of value for cultivation in Ontario We are at present unable to recommend any of the varieties which we have grown as being suitable for our Northern climate.

Some of the varieties here mentioned have been grown under experiment in each of the past six years, and the results show the following annual yields of green crop per acre of each variety :—Yellow Soy Beans, 8 1 tons ; Crimson Clover, 7.6 tons ; Grass Peas, 7.3 tons ; Prussian Blue Peas, 6 tons, and Horse Beans, 5 4 tons.

Varieties of Millet for Green Fodder and for Hay.

Millet is grown extensively in Siberia, India, Japan, and China where the seed is used largely as a human food. It is estimated that the seed of millet, in one form or another, is used as a portion of the food of fully one-third of the inhabitants of the globe. In Ontario, however, its chief use is for the production of green fodder or hay. Some farmers grow millet more or less extensively as a regular crop, but, as a rule, it is sown to supplement some other crop which, from some cause or other, has proven a partial failure. It is found that in some seasons the amount of rainfall is so abundant during the latter part of May and the early part of June, that it is impossible to get the corn planted in good condition ; in which case the land can frequently be used to good advantage in growing millet, as it does not require to be sown until comparatively late in the season. In this way, the loss of the corn crop would not be felt so seriously as it would have been had not a fodder crop been secured from the land. It will, therefore, be readily seen that the millet crop is frequently an important one for the farmers of Ontario, as it can be used so readily when other fodder crops are apt to be deficient.

Upwards of thirty varieties of millet have been grown under experiment at the College for the purpose of gaining information as to the most suitable kind for cultivation in this Province. Fourteen varieties have been under experiment in each of seven consecutive years, and the average results, therefore, are very valuable in showing the comparative values of these different varieties. As the fourteen different kinds of millet here referred to belong to four distinct classes, the results are presented for the varieties included in the various classes separately :

	Tons of hay per acre, average seven years.
1. Broom Corn Millets. (*Panicum miliaceum*).	
Japanese Panicle	4.84
White French	2.70
Red French	2.31
2. Foxtail Millets. (*Choetechola Italica*).	
Holy Terror Gold Mine	5.11
Golden Wonder	4.83
*Japanese Common	4.72
Magic	4.37
German or Golden	4.09
Hungarian Grass	3.64
Salzer's Dakota	3.73
Common	3.66
California	3.12
3. Barnyard Millets. (*Panicum crus galli*).	
Japanese Barnyard	4.44
4 Pearl Millets. (*Pennisetum typhoideum*).	
East India Pearl	5.31

Although the East India Pearl variety has given the largest yield of hay per acre still it is an exceedingly late and leafy millet which resembles sorghum in many ways and which never matures in Ontario. The Holy Terror Gold Mine variety belongs t

*Average for six years only.

the same class as the Hungarian Grass and Common Millet, but is a very vigorous grower and a much heavier producer than either of the more common varieties The Japanese Panicle Millet, which has given an average of 4.8 tons of hay per acre in our experimental grounds at the College, has also made a very high record in the co-operative experiments throughout Ontario, surpassing the Hungarian Grass 33 per cent. in the experiments of last year.

Varieties of Grasses.

Experiments have been conducted within the past few years with the object of gleaning definite information regarding the comparative yields of hay per acre produced by the different varieties of grasses. My report for 1900 gives the average yield of hay produced by each of eighteen varieties of grasses, which were cropped in each of six different years. We are now directing our attention more particularly to the comparative characteristics of these grasses for the purpose of pasture. In order to glean information along this line, each variety of grass was cut in 1901 on the 9th of May. Four other cuttings followed with intervals of three weeks between each two cuttings, and a sixth cutting was made nine weeks after the crops were cut for the fifth time. The growth of the grasses being much slower in the autumn of the year, a greater period was allowed between the cuttings. This line of investigation is furnishing us with some excellent information regarding the different varieties when the growth of each is removed from the plots frequently. Some of the varieties furnish comparatively heavy crops early in the season and give only light cuttings in the autumn, while other varieties are somewhat later in the spring in making a rapid growth, but furnish satisfactory crops later in the season. The Tall Oat Grass, Virginia Lyme Grass, Yellow Oat Grass, Orchard Grass, Timothy, and Western Rye Grass gave the heaviest cuttings on May 9th in the order herein mentioned, the Tall Oat Grass producing the heaviest yield. At the last cutting in the autumn, the largest amount of grass was produced by the Orchard Grass, Kentucky Blue Grass, Perennial Rye Grass, and Yellow Oat Grass, in the order named. Taking the season as a whole, the greatest amount of grass for the six cuttings was produced by the Tall Oat Grass, Orchard Grass, Virginia Lyme Grass, and the Western Rye Grass, and the smallest amount by the Creeping Bent, Rhode Island Bent, Meadow Foxtail, and Red Top. This experiment will likely be continued along similar lines in future years when fuller information of greater value can be furnished.

Varieties of Clovers.

As with the grasses, different varieties of clovers have been grown under experiment for several years, and the results have been published in the annual reports from time to time. Special attention is now being given to the study of some of the varieties as producers of crops which can be pastured on the land. Lucerne, Common Red Clover, Mammoth Red Clover and Alsike Clover were sown in our experimental grounds in the spring of 1900, and winter rye was sown in the autumn of the same year. On the 9th of May, 1901, the crop on each plot was cut, weighed, and removed from the land. After the clovers were cut for the first time, they were allowed to grow for a period of three weeks when they were again cut, weighed, and removed. This was repeated at equal intervals until the fifth cutting was made, which was twelve weeks later than the time of the first cutting. Even a sixth cutting was made in the autumn, but a period of nine weeks was allowed between the fifth and the sixth cuttings, as the growth of the clovers was slow during the latter part of the season. Unfortunately the crop of Lucerne was cut in the autumn at the wrong time, and the material was not weighed. In examining the results of this experiment, it is found that the five cuttings gave the following total yield of green clover per acre: Lucerne, 13.4 tons Common Red Clover, 11.9 tons; Mammoth Red Clover, 10.8 tons; Alsike Clover, 10.2 tons; and Winter Rye, 5.0 tons. These figures represent the amounts of pasture material which would likely be furnished by each kind of crop during the greater part of the summer. The Winter Rye produced only a small crop at the fourth cutting and nothing whatever at the fifth cutting. It is quite probable that the Winter Rye would make a higher record than this in some seasons. The greatest yield of green crop per acre was produced by the Lucerne at the first cutting, by the Mammoth Red Clover at the second cutting, by the Alsike Clover at the third cutting, by the Lucerne at the fourth cutting, and by the Common Red Clover at the fifth cutting. Although Lucerne produced the largest amount of green material per acre in the five

cuttings, still it is seen from examination of the results, that the growth of the Common Red Clover was the most uniform throughout the entire season, there being no cutting which gave less than one ton of green crop per acre as the result of three weeks' growth. It should be remembered in connection with this experiment, that Lucerne does not get its full growth until the third year after seeding.

Mixtures of Grasses and Clovers for Hay.

In the spring of 1897, twenty-one mixtures of grasses and clovers were sown with a grain crop. Crops were taken from the twenty-one plots in 1898 and in 1899. An experiment similar to this was again started in 1898 by sowing similar mixtures on twenty-one other plots. These plots produced two crops in 1899 and also in 1900, and a few of them produced three crops the second year. In the spring of 1900 the experiment was repeated for the third time, but, owing to incomplete germination of some of the varieties, no results from that seeding are given. In the spring of 1901, however, a complete set of twenty-one plots were sown in duplicate, making in all forty-two plots for the experiment sown in the spring of the past year. There were four grasses and four clovers used in this experiment. The grasses were: Timothy, Meadow Fescue, Tall Oat Grass, and Orchard Grass; and the clovers were: Common Red, Mammoth Red, Alsike, and Lucerne. Each mixture was made up of either one grass and one clover, two grasses and two clovers, or four grasses and four clovers.

As this experiment has already been conducted in full at two different periods, the average results are becoming valuable. We find, from a study of the crops produced from the various mixtures, that the Tall Oat Grass and Lucerne gave an average of 3.2 tons of hay; the Tall Oat Grass, Orchard Grass, Mammoth Red Clover, and Lucerne gave an average of 3.1 tons of hay; and the Timothy and Lucerne gave an average of 3.1 tons of hay per acre; thus each of these gave upwards of 3 tons of cured hay per acre per annum. Nearly all of the others gave a yield of between 2 and 3 tons per acre, except some of the mixtures containing Orchard Grass, which gave slightly below 2 tons per acre. The Orchard Grass was considerably killed during the second winter. It will be observed that Lucerne was one of the varieties in each of the three mixtures which gave the largest yields of hay per acre. In the average results of the first year's crop after seeding, the Tall Oat Grass and the Mammoth Red Clover gave the largest yield of hay per acre at the first cutting, the yield being 3 tons; and the Orchard Grass and Lucerne gave the largest yield of hay per acre at the second cutting, viz, 1 ton. In the average results of the second year's crop after seeding, the Timothy and Lucerne gave the largest yield of hay (2.4 tons) per acre at the first cutting; and the Tall Oat Grass and Lucerne gave the largest yield of hay (.5 tons) per acre at the second cutting. The only mixtures from which there was a third cutting in the one season were those mixtures in which Lucerne was used. The mixture which gave the largest yield of hay in the third cutting was composed of Tall Oat Grass and Lucerne.

Grasses and Clovers Sown in the Fall and in the Spring Both With and Without a Nurse Crop.

Fully five million acres of land are used annually in Ontario for growing grasses and clovers. About one-half of this area is used for pasture purposes, and the other half for the production of hay. A large portion of the pasture results from the sowing of clover and grass seed, principally common red clover and timothy. A large area of the pasture land, however, has never been plowed and, therefore, produces those grasses and clovers which are principally native to Ontario. These natural grass lands produce pasture of fairly good quality, which is, however, usually quite limited in amount, except in special instances. The greater amount of hay grown in Ontario is that produced from either timothy or common red clover, sown separately or in combination. In some sections however, a considerable amount of Alsike clover is being used. As we realize the great area devoted to the pasture and hay crops in Ontario, it seems rather strange that so little has been done with the object of trying to get more definite information regarding the methods of sowing, the dates of sowing, the varieties of grasses and clovers, etc., which are likely to give the best results throughout a series of years. It was in consideration of these points that an experiment was started in our experimental grounds in the autumn of 1896 and the spring of 1897, which was continued until the autumn of 1898,

and which was started for the second time in the autumn of 1899 and the spring of 1900 and was completed at the end of the present year. This experiment, therefore, has been carried out with great care during two separate periods under quite similar conditions, with the exceptions of those brought about by the climatic changes of the different seasons. As the conditions of seasons vary so much from year to year, it is important to have these experiments repeated several times in order to obtain average results which are as reliable as possible, and which form a fairly accurate guide to those most interested.

Three prominent varieties of grasses and three prominent varieties of clovers were sown in the autumn of the year with winter wheat and without winter wheat, and in the spring of the year with oats and without oats. The same quantities of seeds were used for the different seedings of each kind of clover and of each kind of grass. The crops produced during each of the first and second summers after seeding took place, were cut and weighed first, as green crop, and, second, as a hay crop. In order to be very accurate in regard to the production of hay, three weighings were always made of each crop before it was removed from the plot.

The tabulated results here given represent the average yield of hay in tons per acre for each grass sown under each of the conditions of the experiment. The figures in every case represent the average of two distinct experiments.

Results of different sowings of Grasses and Clovers.

Crops.	Tons of Hay per Acre.			
	Autumn Showing.		Spring Showing.	
	Winter Wheat.	No Nurse Crop.	Oats.	No Nurse Crop.
Orchard Grass	3.49	4.20	4.44	3.73
Meadow Fescue	2.12	2.86	3.66	3.64
Timothy	2.94	3.44	3.27	4.28
Common Red	3.07	1.09	3.61	4.18
Alsike Clover	2.66	.91	2.47	2.79
Lucerne	3.65	1.42	4.03	4.17
Average 3 Grasses	2.85	3.50	3.79	3.89
Average 3 Clovers	3.13	1.14	3.37	3.71

It will be seen that the figures given in the tabulated form represent the yields per acre for only the second summer after seeding. In the first experiment, the Orchard Grass, the Meadow Fescue, and the Timothy, which were sown in the autumn with a grain crop, produced hay in the following summer as follows: Orchard Grass, 3 tons per acre; Meadow Fescue, 4.6 tons per acre; and Timothy, 4.6 tons per acre. In the second experiment, these same three grasses, which were sown in the autumn without winter wheat, also produced hay the following year, the yields being as follows: Orchard Grass, 1 ton per acre; Meadow Fescue, 1.1 tons per acre; and Timothy 2.1 tons per acre. Each of the grasses and the clovers sown in the first experiment without a grain crop in the spring of the year, produced the following yields of hay per acre in the first summer after the seed was sown as follows: Orchard Grass, 2.2 tons; Meadow Fescue, 3.2 tons; Timothy, 1.7 tons; Common Red Clover, 1.9 tons; Alsike Clover, 2 1 tons; and Lucerne, 1.5 tons. These were the only crops which were of sufficient quantity to cut and weigh in the first summer after sowing.

It will be seen from the figures given in the table here presented that the amount of hay produced from sowing the clover in the autumn of the year without any grain crop is very small. In the first experiment, the clovers which were sown alone in the autumn made a good growth before the winter started, but were completely killed before spring. Although the clovers, which were sown alone in the autumn in the second experiment, did not fare as badly as those of the first experiment, still the results were poor in comparison with those of other seedings. Both the grasses and clovers gave good results when sown in the spring, either with or without a grain crop. The grasses also gave fairly good results when sown in the autumn, either alone or with winter wheat. Timothy gave rather better results when sown in the spring with oats, than when sown in the autumn with winter

wheat, but in both seasons it gave a larger yield per acre when sown alone than when sown with a grain crop. The Orchard Grass gave much better results when sown in the spring with a nurse crop, than when sown in the spring without any other crop. In studying these figures, it must be remembered that where the grass and clover seed has been sown with either winter wheat or with oats, there is a great advantage in having the grain crop, which is likely to be more valuable in most instances than the increase in the yield of the grasses or the clovers when sown by themselves.

Mixtures of Hardy Grasses and Clovers for the Production of Either Hay or Pasture.

A large amount of experimental work has been done in testing varieties of grasses and clovers, both singly and in combination, within the past twenty-five years. The grasses and clovers have been carefully studied, and much information has been gleaned in regard to their value for hay and also for pasture. In 1885, Prof. Wm. Brown, who was then Farm Superintendent at the Ontario Agricultural College, recommended a mixture which he thought well adapted for permanent pasture. Only the most hardy varieties which had been tested up to that time were included in the mixture. In 1893, after eight years additional experimental work, during which time the writer was closely connected with the work of the Experimental Department, another mixture was recommended containing a smaller number of varieties and requiring a smaller amount of seed per acre. The grasses and clovers recommended in 1893 have proven themselves to be a valuable mixture. They are all hardy varieties, and when grown together give a large yield. An experiment was started in the spring of 1894 by sowing plots of the mixture which was recommended in 1885, and plots of the mixture which was recommended in 1893. The seed was sown with a light seeding of barley; and the germination of the seed of the grasses and clovers was quite satisfactory.

Mixture recommended in	Grasses and clovers.	Varieties in mixtures.	Amount of seed per acre.	Average height of 1st cutting: Average for seven years.	Yield of hay per acre: 1901, three cuttings.	Yield of hay per acre: Average seven years, 1895-6-7-8-9, 1900, 1901,—17 cuttings.
			lbs.	inches.	tons.	tons.
1885	Grasses	Meadow Fescue	6	31.4	4.16	4.60
	"	Meadow Foxtail	3			
	"	English Rye	2			
	"	Timothy	3			
	"	Canadian Blue	4			
	"	Orchard	3			
	"	Red Top	2			
	"	Yellow Oat	2			
	Clovers	Lucerne	4			
	"	White	2			
	"	Alsike	2			
	"	Red	1			
	"	Yellow	1			
		Total amount of seed used.	35			
1893	Grasses	Orchard	4	35.6	4.60	5.34
	"	Meadow Fescue	4			
	"	Tall Oat	3			
	"	Timothy	2			
	"	Meadow Foxtail	2			
	Clovers	Lucerne	5			
	"	Alsike	2			
	"	White or Dutch	1			
	"	Yellow or Trefoil	1			
		Total amount of seed used.	24			

Two cuttings were made from each plot in 1895, and from two to three cuttings have been secured in each of the years since that date. In 1901, which is the eighth year since the plots were sown, no less than three cuttings were taken from each plot. The total yield of hay produced from the three cuttings was 4.6 tons from the mixture recommended in 1893, and 4.2 tons from the mixture recommended in 1885. The figures presented in this report show the comparative yields of hay from the two mixtures. They also show that the grasses used for the mixtures are very suitable for the Ontario climate. These mixtures can be used for the production of either hay or pasture. Without a single exception, the mixture which was recommended in 1893 has produced a larger yield per acre than that which was recommended in 1885. We have named all the varieties of grasses and clovers sown in each mixture, and also the quantity of seed per acre, particularly for two reasons :—In the first place, that this experiment might thus be as clear as possible, and in the second place, that any person wishing to know the quantity of seed per acre of the different varieties which were recommended as a permanent pasture mixture could find the information in good form. It will be observed that the mixture recommended in 1893 possesses none but very hardy grasses, which have been tested at the College more or less for fully twenty years. This mixture could, of course, be somewhat modified to suit different localities and different soils.

Annual Crops for Pasture.

But little has been done in testing our annual crops for the purpose of pasturing. In order to find out which annual crops are likely to give the best results when pastured, an interesting experiment was started in the spring of 1900, and has now been conducted for two years in succession. For this purpose we tested eighteen different crops and three different mixtures. In each of the two years the crops were sown in three separate sets, there being twenty-one plots in each set, thus making in all a total of sixty-three plots. All of the plots were sown on the same day and under similar conditions in each year. The separate crops included in this experiment were as follows : (1) oats, (2) barley, (3) spring wheat, (4) buckwheat, (5) spring rye, (6) millet, (7) corn, (8) sugar cane, (9) kaffir corn, (10) common red clover, (11) crimson clover, (12) common vetches, (13) hairy vetches, (14) field peas, (15) grass peas, (16) cow peas, (17) yellow soy beans, and (18) rape. The mixtures which were used were combinations of some of the crops given in the foregoing list and were made up as follows : (1) oats and peas, (2) oats and common vetches, and (3) oats and hairy vetches.

The main object of the experiment was to find out the relative value of the different crops in producing the greatest amount of the most valuable material for pasture both early in the season and throughout the summer. The seed was all sown on the 5th of May, in 1900, and on the 6th of May, in 1901. The three sets were handled in each of the years as follows :

Set 1. The crops on all the plots in Set 1 were cut at the end of six, nine, twelve, fifteen, and eighteen weeks after the seed was sown, thus making five cuttings for each crop. Each cutting was weighed in the green state, and also after it was dried in the form of hay.

Set 2. Each crop was cut when it was considered to contain the greatest bulk of the best quality for feeding as green fodder. In order to ascertain the aftergrowth, another cutting was also made on each plot later in the season.

Set 3. A hurdle fence was placed around the set of twenty-one plots and cattle were turned on the plots daily until the pasture was all eaten. The first pasturing took place in the latter part of June and in the early part of July. Careful notes were taken of the amount of crop eaten from each crop on each day. After the crops were pastured the first time, they were allowed to remain undisturbed until the autumn, when the cattle were again turned in and the second growth was eaten off.

The importance of this experiment will be realized when it is considered that, through various causes, the timothy and clover pastures in many sections of Ontario frequently fail to produce even a moderate amount of pasture for live stock. The germination of the seed is sometimes poor, the young plants are occasionally killed by the hot, dry weather of summer, or by the sudden changes of the weather in the winter and in the early

spring, and thus the foundation for a good pasture is destroyed in the early stages of its existence. When failures of this kind occur, the farmer is often at a loss to know what to do to supplement his pasture in the best possible way. A considerable amount of work has already been done in testing different crops for cutting in the green condition for feeding to animals when required in the summer season. Some work has also been done in feeding corn silage in the summer months when the pastures supply an insufficient amount of food material. Although a good many enquiries have been made regarding the comparative value of different annual crops for pasture purposes, it is difficult to give the desired information owing to the lack of definite experimental work along this line. We hope that the experiment now under consideration will gradually throw more light upon this question, and furnish information which will be of much service to farmers who wish to supplement their ordinary pasture lands by sowing spring crops to be used for pasture purposes the same season.

The table here presented gives the average results for the two years in yield of green crop per acre produced by each variety and by each mixture on the five dates of cutting, as determined in Set 1. It also gives the total amount of green material produced from the five cuttings of each crop.

Yields of green pasture per acre.

Crops.	Tons of green pasture crop per acre at each cutting. Average two years.					Total number of tons per acre in five cuttings.
	1st cutting, 6 weeks after seeding.	2d cutting, 9 weeks after seeding.	3rd cutting, 12 weeks after seeding.	4th cutting, 15 weeks after seeding.	5th cutting, 18 weeks after seeding.	
1. Hairy Vetches	1.2	4.0	1.6	1.9	.5	9.0
2. Sugar Cane	.1	2.3	2.4	1.1	.7	6.6
3. Grass Peas	1.9	2.6	1.0	.3	.1	5.8
4. Oats	2.5	2.4	.6	.3	.1	5.8
5. Common Vetches	1.5	2.3	.7	.7	.4	5.5
6. Corn	.5	3.2	1.1	.7	.0	5.4
7. Spring Rye	4.6	.7	.2	.0	.0	5.4
8. Millet	.7	2.5	.8	1.1	.3	5.3
9. Rape	.1	2.9	.8	.8	.7	5.2
10. Crimson Clover	.0	2.3	.6	1.0	1.1	4.9
11. Buckwheat	3.5	.2	.8	.0	.0	4.4
12. Kaffir Corn	.0	2.3	.6	.8	.6	4.3
13. Common Red Clover	.0	1.4	.8	1.0	1.0	4.2
14. Field Peas	2.2	1.5	.4	.0	.0	4.1
15. Barley	2.6	1.2	.3	.0	.0	4.0
16. Yellow Soy Beans	.5	1.8	.8	.5	.4	3.9
17. Cow Peas	.1	2.7	.4	.3	.1	3.5
18. Spring Wheat	1.8	1.0	.3	.0	.0	3.0
Mixtures.						
1. Oats and Hairy Vetches	2.4	2.7	1.5	1.6	.8	8.8
2. Oats and Common Vetches	3.0	2.5	.9	.7	.3	7.3
3. Oats and Peas	2.8	2.5	.8	.4	.1	6.6

NOTE.—The germination of the seed of all the crops was good, with the exception of the Kaffir Corn, Cow Peas, and Sorghum, which was rather poor, and the Rape and Crimson Clover, which was only fair.

The table is very suggestive as well as interesting. It will be seen that the largest yields of green material per acre were produced by the spring rye, buckwheat, barley and oats on the first date of cutting; the hairy vetches, corn, rape and cow peas on the second date of cutting; the sugar cane, hairy vetches, corn and grass peas on the third date of cutting; the hairy vetches, sugar cane, millet, crimson clover and common red clover on the fourth date of cutting; and the crimson clover, common red clover, sugar cane, rape and hairy vetches on the last date of cutting. Taking the total amount produced by the five cuttings, it will be observed that the hairy vetches and the sugar cane or sorghum produced the largest amount, and the spring wheat the smallest amount of green crop per acre, the hairy vetches having produced three times as great a yield as the spring wheat.

The barley, spring wheat, buckwheat, spring rye and field peas all gave fairly good crops at the first cutting, but they made practically no growth after the third crop was taken from the land. An important feature in connection with this experiment is the fact that the hairy vetches, the millet and the sugar cane gave such uniformly good results throughout the entire season, and would, therefore, be likely to stand grazing better than most of the other crops in the experiment.

In the second set, in which case the crops were allowed to grow until they reached that stage to produce the largest amount of green fodder of good quality, it was found that the greatest yields were produced by the hairy vetches, oats and peas, field peas and grass peas in 1900, and by corn, rape, yellow soy beans, hairy vetches, and common red clover in 1901. In no case did the second crop in No. 2 set reach one ton of green material per acre in 1900, but in the past year the crimson clover produced 5.3 tons, and the common red clover 3.5 tons of green crop per acre at the time of the second cutting. Taking the average results of the distinct varieties for the two years, it was found that the greatest yield of green crop per acre was produced by the hairy vetches, 9.9 tons, and the second greatest yield by the corn, 9.6 tons. It was also observed that the mixture of oats and hairy vetches gave an average of 8.8 tons, the mixture of oats and peas 8.2 tons, and the mixture of oats and common vetches 7.8 tons of green crop per acre.

In the third set, where the different crops were pastured, it was found that the spring wheat, corn, oats, barley, millet, rape, kaffir corn and sugar cane were eaten the most readily by the animals. With the exception of buckwheat and spring rye, all the crops, however, appeared to be relished fairly well by the animals. As the rye is a very rapid grower, it was found that even six weeks after the time of seeding the rye crop was perhaps a little too far advanced to be relished by the animals as much as it would have been had it been pastured a week previous.

The results of this experiment up to the present time, seem to show the advantage of growing a mixture of annual crops rather than growing the crops separately for pasture purposes. The results indicate that the following combinations should prove serviceable for the production of pasture of good quality throughout the season, viz.: 1. Spring wheat, grass peas and common red clover; 2. Spring rye, millet and hairy vetches; 3. Oats, sorghum and hairy vetches, etc.

Conclusion.

We have tried to be accurate in every detail of our work, and hope that the record of the results presented may prove of real service to the farmers of Ontario.

I wish to thank both yourself and the Minister of Agriculture for the kindly support given me in the work of the Experimental Department, and for the leave of absence granted me to visit Europe and to study European agriculture.

Respectfully submitted,

C. A. ZAVITZ,
Experimentalist.

PART XII.

REPORT OF MANAGER OF POULTRY DEPARTMENT.

To the President of the Ontario Agricultural College:

SIR,—I have the honor of presenting herewith the report of the Poultry Department for the year 1901. A larger amount of experimental work than usual has been carried on this year, especially along the line of fattening chickens, and now that we have on the premises a separate house for this work, a far larger number of experiments can be conducted.

The correspondence is steadily increasing and it is gratifying to find many farmers and others taking much more interest than formerly in commercial poultry; and I have no doubt whatever that they will continue to take more interest along these lines, as we have now at our door practically an unlimited market at good paying prices for the first grade of dressed poultry. I regret to say, however, that there is far too much poultry placed on the market in a poor condition, both as to dressing and as regards the color of the flesh and the plumpness of the body. We also notice a large number of the lighter breeds of poultry offered for sale, such as Leghorns. These are all right in their place, but not profitable for fattening purposes.

I regret very much that there are still many complaints from our large egg dealers about the high percentage of bad eggs received by them during the warm summer months, especially in July and August. This is to a large extent due to the indifference among those keeping poultry for egg production, about removing the male bird from the flock after the breeding season. A case came under my observation this summer in which six eggs out of eight had developed more or less growth of the embryo. These eggs looked nice and fresh, and certainly had not been sat upon by the hens; and it was only when held to the candle that the badness could be detected. Had these partially hatched eggs not been removed they would have been rotten in a short time. It seems to be generally forgotten that less than 90 degrees of heat will start an egg to hatch, and with this temperature as a hatching point what must a case of eggs be like that has travelled for several hours in the hot sun on a summer day? When the eggs are not fertilized there is no germ to develop and no decomposition takes place.

The usual instruction has been given to the first and second year students, also to the Farm Dairy Class.

The new poultry school now in the course of construction will give many poultrymen, farmers and others an opportunity to see and learn how to handle fowls to advantage. The lectures to be given by a few of our most successful poultrymen will be worth many times the cost of the course to the student; and I wish to add just here that the course, as outlined, will be as useful to the poultryman of some years experience as to the novice.

EGG PRODUCTION.

Eggs were produced in fair numbers during the winter. The Plymouth Rocks, Wyandottes, and Langshans laid much more freely than did the lighter birds, such as Leghorns, Minorcas, and Andalusians. The birds came through the winter in good condition; in fact, I never had so few sick birds during the spring of the year. By using the method of feeding as outlined in last year's report, we had no over-fat hens and thus avoided much trouble from liver disease, etc. We made use of the trap-nests as much as possible during the year; but owing to our not having a plan of the nest early in the season, we have records dating only from the first of April. By using these nests we can easily weed out the poor layers. I must say, however, that a large amount of time is spent in releasing the laying hens and in keeping the individual egg-records; but the labor is a source of profit to the breeder of utility birds and especially to the fancy poultry breeder, as with these nests he can furnish a pedigree of each chicken. With them we have discovered that one of our Barred Rock hens is rather an exceptional egg producer, having laid 49 eggs in 49 consecutive days and 151 eggs from April 1st to Nov. 1st. This hen offers to set, but is easily broken and starts laying again very readily.

Cost of Producing Summer Eggs.

During the past year a number of enquiries were received, asking for information as to the exact cost of producing a dozen of eggs during the summer months. With this object in view we selected two pens of hens, one of Barred Plymouth Rocks and the other of Andalusians. Each pen consisted of 12 hens and a male bird. By selecting these two breeds, it was thought we would get fair average results, as the Rocks are considered only moderate summer layers and good winter layers, whereas the opposite might be said of the Andalusians.

Each flock had a pen in the poultry house, 12 feet by 14 feet, and a sodded yard attached, 80 feet deep and the same width of the pen. From this it will be seen that the hens were supplied with all their food, with the exception of the grass in the yards. In the cost of production, as outlined below, no account is taken of labor, and no credit is given for the manure.

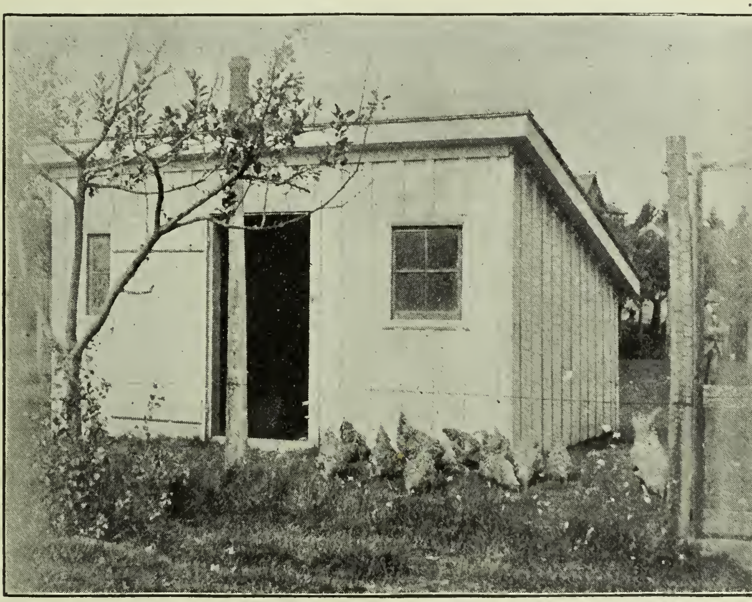


Fig. 1.—Colony House, of which there are four now in use.

Each 10 x 14 ft; height at front, 7 ft., at back, 4½ ft. For summer use, but well and strongly built.

The hens were usually fed four times a day—whole grain in the litter or straw, in the morning; meat or bone at noon, three or four times per week; other days no noon feed was given. Mash at four in the afternoon, composed of equal parts of bran, shorts, and ground oats, moistened with skim milk; just before dark, a little whole grain. During the first month, cracked wheat and pin-head oatmeal were used for the morning feed, for the reason that at that season of the year we want excessive excercise in order to reduce the large amount of fat that is generally found upon hens that have been forced for winter laying. These very small grains, when scattered in deep straw, require considerable work to get them out, and thus we avoid apoplexy, which is quite common, especially among Rock hens, during the spring.

Fig. 2.—Brooder House.
140 x 14 ft., 7 ft. high at eaves.

Fig. 3.—Breeding Pen House.
108 x 15 ft., 6 ft. 6 inches to eaves, with open runs in front ; plum trees for shade.

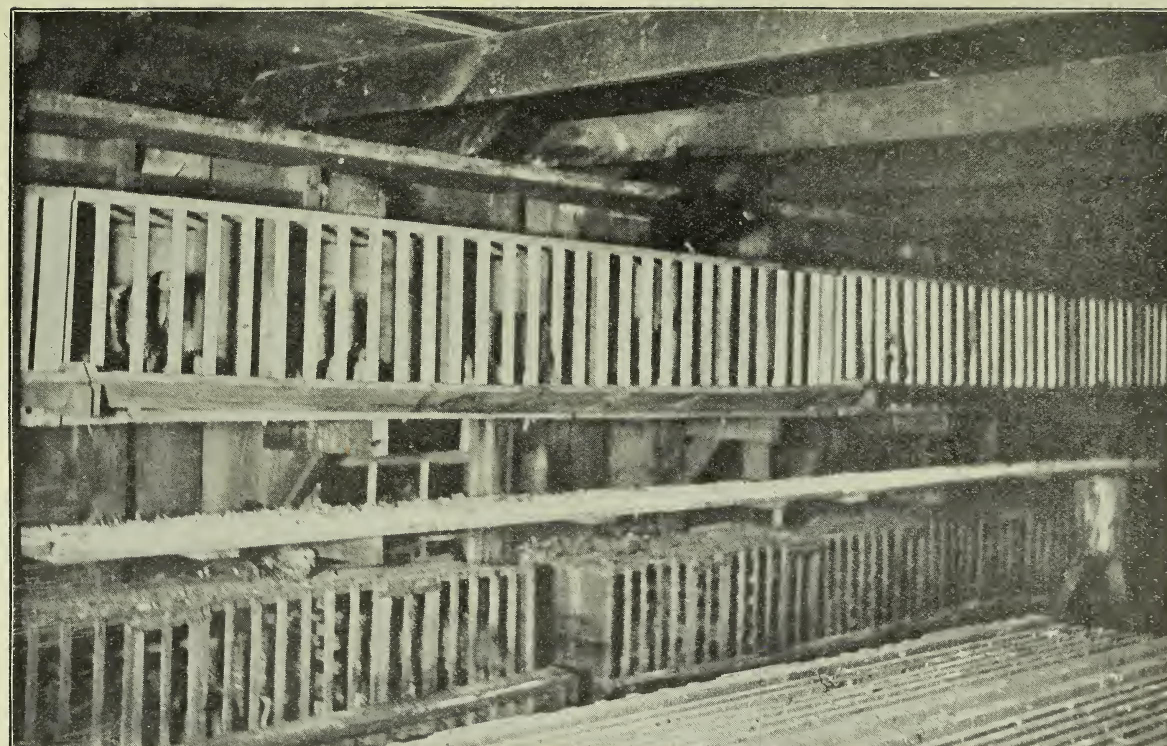


Fig. 4.—Partial view of Inside of Fattening House.

Showing arrangement of pens. Pens at sides two tiers high. In centre, one row, of which top is seen in foreground. Two or three loose chickens act as scavengers and pick up food scratched out of troughs on to floor.

April 22nd to May 22nd. Rocks—13 hens, 1 cock:

Mixed feed—17.687 lbs., at $1.33 per cwt	23.576 cents.
Bone—12.687 lbs., at $1.00 per cwt	16.687 "
Mash—32.375 lbs., at 90c. per cwt	29.137 "
Wheat—21.875 lbs., at $1.13 per cwt	27.79 "
Milk—32 lbs., at 15c. per cwt	3.33 "
Total	100.52 "

Eggs laid, 16 dozen; cost per dozen, 6.28 cents.
Nearly all Rocks were broody during last week.

April 22nd to May 22nd. Andalusians—13 hens, 1 cock:

Mixed cracked grain—14.3 lbs., at $1.33 per cwt	25.99 cents.
Green bone—13.75 lbs., at $1.00 per cwt	13.75 "
Mash—35 lbs., at 90c. per cwt	31.05 "
Wheat—24 lbs., at $1.33 per cwt., or 68c. per bushel	27.19 "
Milk—35 lbs., at 10c. per cwt	3.5 "
Total	101.48 "

Eggs laid, 20½ dozen; cost per dozen, 4.9 cents.

May 22nd to June 22nd. Barred Rocks:

Oats—2 lbs 8 ozs., at $1.00 per cwt	2.8 cents.
Bone 2 lbs., at $1.00 per cwt	11. "
Mash—40 lbs., at 90c. per cwt	36. "
Milk—40 lbs., at 10c. per cwt	4. "
Wheat—34 lbs. 13 ozs., at $1.13 per cwt	39.58 "
Total	93.38 "

Eggs laid, 13 dozen and 10 eggs; cost per dozen, 6.82 cents.

May 22nd to June 22nd. Andalusians:

Milk—40 lbs., at 10c. per cwt	4. cents.
Oats—3 lbs., at $1.00 per cwt	3. "
Wheat—35 lbs. 7 ozs., at $1.13 per cwt	40.15 "
Mash—40 lbs., at 90c. per cwt	36. "
Bone—11 lbs. 6 ozs., at $1.00 per cwt	11.37 "
Total	94.52 "

Eggs laid 18 dozen and 2; cost per dozen, 5.21 cents.

June 22nd to July 22nd. Barred Rocks:

Wheat—26.375 lbs., at $1.13 per cwt	29.80 cents.
Oats—6.25 lbs., at $1.00 per cwt	6.25 "
Mash—41.75 lbs., at 90c. per cwt	37.57 "
Milk—41 lbs., at 10c per cwt	4.1 "
Bone—1 lb., at $1.00 per cwt	1.00 "
Total cost	78.72 "

Eggs laid, 13 dozen and 10; cost per dozen, 5.69 cents.

June 22nd to July 22nd. Andalusians:

Wheat—35.625 lbs., at $1.13 per cwt	40.25 cents.
Oats—6.25 lbs., at $1.00 per cwt	6.5 "
Mash—40 lbs., at 90c. per cwt	36.00 "
Milk—40 lbs., at 10c. per cwt	4.00 "
Bone—1 lb., at $1.00 per cwt	1.00 "
Total cost	87.75 "

Eggs laid, 16 dozen and 1; cost per dozen, 5.42 cents.

July 22nd to August 22nd. Barred Rocks:

Wheat—32.625 lbs., at $1.13 per cwt	37.99 cents.
Oats—9 lbs., at $1.00 per cwt	9.00 "
Mash—39.5 lbs., at 90c. per cwt	35.55 "
Milk—40 lbs., at 10c per cwt	4.00 "
Bone—12 lb., at $1.00 per cwt	2.00 "
Total cost	88.54 "

Eggs laid, 14 dozen and 1; cost per dozen, 6.28 cents.

July 22nd to August 22nd. Andalusians:

Wheat—27.25 lbs., at $1.13 per cwt	30.79 cents.
Oats—14.875 lbs., at $1.00 per cwt	14.875 "
Mash—40.5 lbs., at 90c. per cwt	36.45 "
Milk—40 lbs., at 10c. per cwt	4.00 "
Bone—3 lbs., at 1.00 per cwt	3.00 "
Total cost	89.115 "

Eggs laid, 14 dozen and 9; cost per dozen, 5 cents.
Average cost per dozen for Rocks, 6.32 cents per dozen.
Average cost per dozen for Andalusians, 5.38 cents per dozen.

Hatching Season.

Generally speaking, this was not a good year; in fact, this has been so for the past two or three seasons, both in Canada and in the United States. It is a problem that is

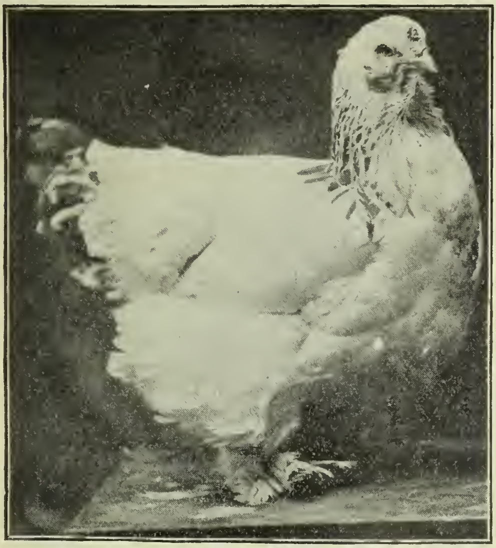


Fig. 5.—Light Brahma Hen.

Note massiveness. An all-round good specimen.

Fig. 6.—A Blocky White Wyandotte Pullet.

Note full breast.

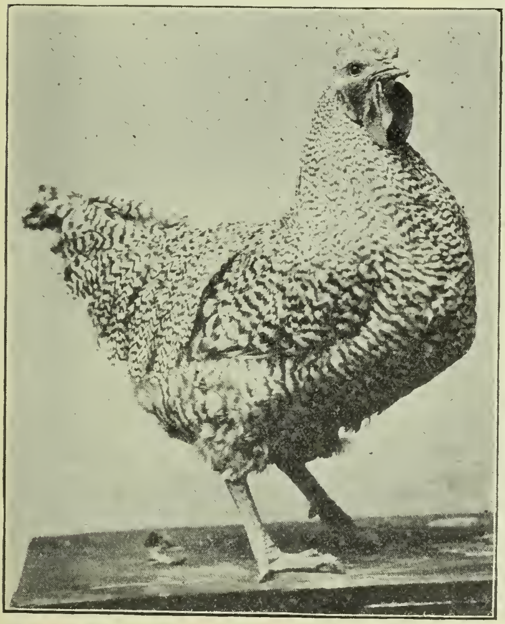


Fig. 7.—Barred Plymouth Rock Cock.

A favorite as a sire of utility birds, especially for fattening purposes. Note grand depth and breadth of body.

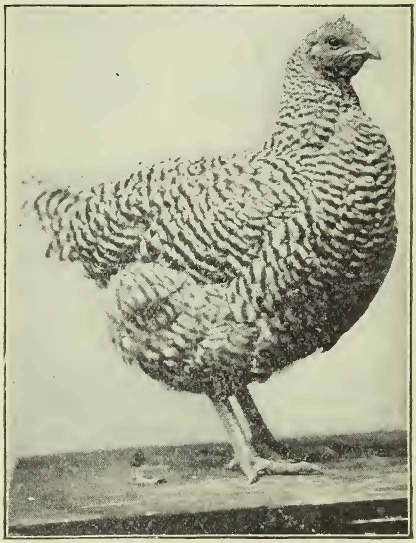


Fig. 8.—A Barred Plymouth Rock Hen of extra quality.

Good in shape, well barred, and handles well.

baffling our very best poultrymen; and we are as yet, to a large extent, in the dark as to the cause or causes of the lack of fertility in the eggs, and, furthermore, as to the weak vitality of many of those that are fertilized.

We had fair hatches from January eggs, about 50 per cent.; but February and March eggs were practically useless. Not only was this so here, but it was the same at every poultry farm I visited, and caused general complaint from nearly everywhere. This, in a large measure, accounts for the numbers of immature birds exhibited at our fall shows this season. We hope to be able to carry on experiments along these lines this winter, with a view of getting some more definite information upon the subject. I am of

Fig. 9.—Plymouth Rock Pullet. (Daughter of Fig. 8).

Fig. 10.—Andalusian Cock with his Son and Daughter. (See Figs. 11 and 12).

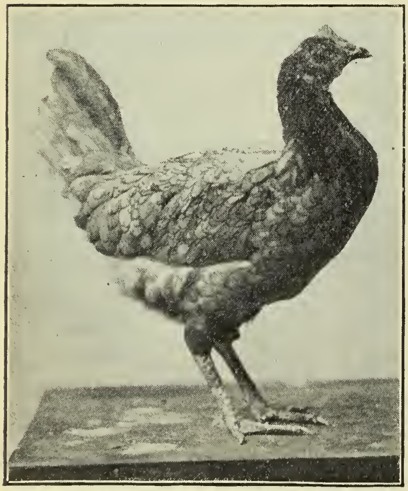


Fig. 11.—Andalusian Pullet. (Daughter of Fig. 10).

Fig. 12.—Andalusian Cockerel. (Son of Fig. 10).

the opinion that our houses, as at present, are too close and stuffy, there being a lack of good pure air. It is very difficult to arrange ventilation by means of doors and windows, without making the house very cold at certain periods of the day. Judging from observations of the past two winters, I would favour the mating of not more than six to eight hens with a male during the winter, and suggest that the male be not in the pen more than about three hours a day, after which time he should be moved to a separate coop

by himself and be well fed. It is also a question of some doubt in my mind as to whether we are not feeding far too much soft mash-food. This food is a great help in producing eggs in quantity; but where fertile eggs are wanted, it would be better to do with a smaller number and have them well fertilized. I may be wholly wrong in these suppositions; but the foregoing is my opinion at present,—largely the result of the observations and experiences of the past few winters.

Natural and Artificial Incubating and Brooding.

The incubators hatched as well as the hens. The early chicks were raised in the brooders; but it was found more convenient to rear some of the later hatched ones with hens. The difficulty in rearing late hatched chickens in brooders during warm weather—late May or June—is that there is a great variation of temperature between day and night, thus making it exceedingly difficult to prevent the brooder from becoming too hot during the day or too cold at night. When the late hatched chicks are put out with

Fig. 13.—A Noted Layer.
Laid, from April 12th. to Nov. 20th, 167 eggs.
Laid 49 eggs in 49 consecutive days.

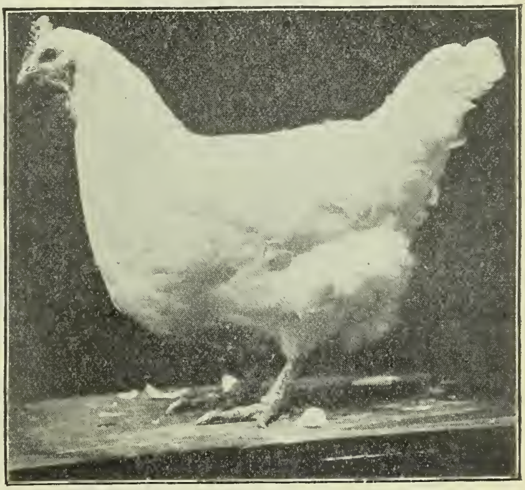


Fig. 14.—White Plymouth Rock Hen.
See breast shape and good length of body.

hens, this difficulty is solved; and, furthermore, the chicks get a greater variety of food in the way of insects than they would get if they were in the brooders.

Ducks.

We raised about 100 ducks this season. The accompanying cut shows the relative sizes of the Pekin, Indian Runner and Rouen grade ducks at ten weeks of age, the Pekin dressing $5\frac{1}{2}$ lbs., the Rouen grade $4\frac{1}{2}$ lbs. and the Indian Runner 4 lbs. From this it will be seen that the Pekin is much the fastest meat producer. The Rouen is as large when mature, but is a rather slow grower, while the Indian Runner is a small duck at any age. They are, however, wonderful layers.

An experiment was conducted in forcing young ducks from the seventh to tenth week by feeding them with the cramming machine. Only one trial was made; but from this it appears that a duck will eat as much of its own free will as we were able to give it by the machine. The results might be very different with older ducks.

Experiments in Fattening Chickens.

Since the first of September we have fattened nearly 1,000 chickens. Experiments have been conducted with different grain rations, also some grain and root rations, and

further with chickens of different weights or ages as well as different methods of cooping. Many of these experiments are still in progress, and it is impossible at this date (December 3rd) to give more than a small amount of the results, but it is expected that the results of these experiments and others will be given in full in bulletin form early in the next year.

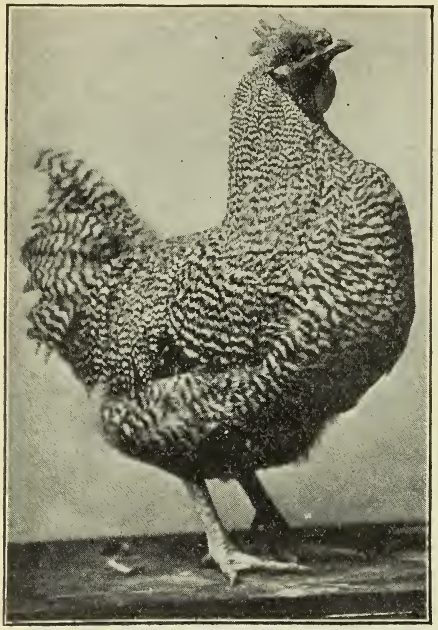


Fig. 15.—Barred Plymouth Rock, and two of his get. (See Figs. 16 and 17).

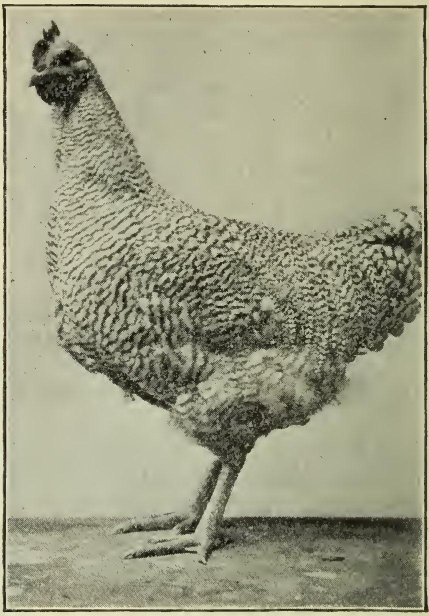


Fig. 16.—Barred Plymouth Rock. (Son of Fig. 15.)

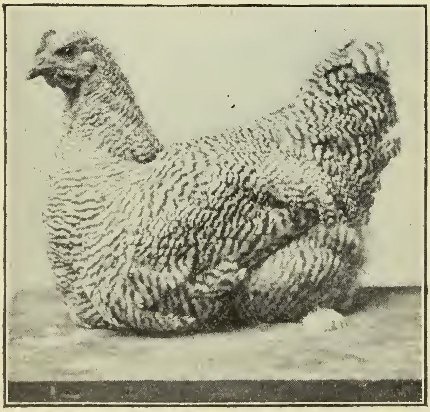


Fig. 17.—Barred Plymouth Rock. (Daughter of Fig. 15).

Fig. 18.—Minorca Hen. (Mother of Figs. 19 and 20).

The majority of the chickens fed have been Plymouth Rocks and Wyandottes and their crosses. We find these two breeds of chickens do well and make very economical gains. Some experimental work has been done in connection as to which is the better breed, but the results so far would indicate that they are very nearly equal.

Grain Rations.

The following table shows the amount of feed consumed by the different groups of chickens, the cost of producing a pound of gain, and the number of pounds of grain it took to make one pound of gain :

—		No. of trials.	Weight when put in crates.	After two weeks' feeding.	Gain.	Grain consumed.	No. of pounds of grain to make 1 lb. gain.	Milk consumed.	Cost of pound of gain.
Group I —			lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	cts.
Cornmeal, 5 parts	Cost per cwt., $1.10	First trial....	43	55	12	35	2.916	35	3.5
Shorts, 4 parts		Second "	48.5	59.5	11	39	3.54	39	4.263
Pearl oat dust, 1 part		Third "	49.5	61	11.5	38	3.3	38	3.974
Animal meal, 1 part		Average....	47	58.5	11.5	37.38	3.252	37.33	3.912
Group II. —									
Cornmeal, 2 parts	Cost per cwt., $1.22	First trial*...	......	......	......	......	......	......	......
Ground buckwheat, 2 parts.		Second "	48.5	65	16.5	42	2.54	42	3.363
Pearl oat dust, 1 part		Third "	48	63	15	40.5	2.7	41	3.56
		Average....	48.25	64	15.75	41.25	2.62	41.5	3.461
Group III.—									
Cornmeal, 4 parts	Cost per cwt. $1.22½	First trial....	45	53	8	35	4.375	35	5.797
Ground buckwheat, 2 parts		Second "	47.5	63	15	41	2.66	41	3.63
Pearl oat dust, 2 parts		Third "	50	62	12	40	3.3	40	4.416
		Average ...	47.5	59.33	11.66	38.66	3.445	38.66	4.614
Group IV.—									
Cornmeal, 2 parts	Cost per cwt., $1.23	First trial....	48	53.5	5.5	34.5	6.27	35	8.34
Pearl oat dust, 1 part		Second "	48	60	12	38	3.18	38	4.22
		Third "	48	58.5	10.5	37	3.52	37	4.686
		Average....	48	57.33	9.33	36.5	4.32	36.66	5.748
Group V.—									
Pearl oat dust—cost per cwt., $1.50		First trial....	48	60	12	34	2.83	34	4.83
		Second "	49	63	14	40	2.85	40	4.57
		Third "	47.5	60	12.5	40	3.2	40	5.12
		Average....	48.166	61	12.83	38	2.96	38	4.84

*This food was not used in the first trial.

The following prices were paid for grain : Corn meal, $1.10 per cwt.; ground buckwheat, $1.20 per cwt.; middlings or shorts, 90c. per cwt.; animal meal, $1.60 per cwt. There were 12 birds in each trial of each group. The last 10 days of the feeding the birds were fed from the cramming machine, one and one-half pounds of milk being used to one pound of grain.

Conclusion.

Ration No. 1 is a good economical producer, but is objectionable, because it has a tendency to produce yellow flesh, which is undesirable in our best market.

Ration No. 2 is, perhaps, the most palatable of any, and it is one that makes a nice white flesh at a moderate cost.

Ration No. 3 is much the same as No. 2, except that it contains more corn-meal, which tends to make it less adapted for use during warm weather. Note the results of the first trial. It has a slight tendency towards producing a creamy flesh.

Ration No. 4 is the most unsatisfactory of all. The excess of corn in it decreases its palatability, and also makes it unsuitable for feeding during warm weather.

Ration No. 5 is a good one, when the oats can be purchased at moderate prices. I am of the opinion that rations Nos. 2 and 5 are both excellent, and which it would be advisable to use would depend largely upon the prices of the different grains.

RESULT OF ONE EXPERIMENT WITH CHICKENS OF DIFFERENT AGES FED BY DIFFERENT METHODS—EXPERIMENT BEGAN OCTOBER 2ND.

Groups.	Grain fed during the first 2 weeks.	Milk fed.	Cost of feed for first 2 weeks.	Gain in 2 weeks.	Cost one pound of gain.	Feed used during the last 10 days.	Milk used.	Gain during last 10 days.	Cost of food for last 10 days.	Cost of one pound of gain.	Total cost for 24 days' feeding.	Total gain during 24 days.	Cost of one pound of gain (24 days.)	Selling price per pound.	How fed.
	lb.	lb.	cts.	lb.	cts.	lb.	lb.	lb.	cts.	cts.	cts.	lb.	cts.	cts.	
No. 10. Average weight $3\frac{1}{2}$ lbs. each (when put up to feed)	41	41	54 12	12	4.51	30	30	3	39.6	13.2	93.72	15	6.248	10	Fed in the fattening crates from the trough only.
No. 11. Average weight $3\frac{1}{2}$ lbs. each...	40	40	52.80	12.75	4.14	36	48	9	53 40	5.93	106.2	21 75	4.88	11	Fed for the first two weeks in the fattening crates from the trough; the last 10 days from the machine.
No. 12. Average weight $3\frac{1}{2}$ lbs. each...	38	38	50.16	8	6.27	24	24	3	31.68	10.55	81.84	11	7.44	9	Fed in a pen, each bird having about 5 square feet of floor space.
No. 2. Average weight $2\frac{3}{4}$ lbs each.	34	34	44.88	6.75	6.65	23.5	24	3	31.07	10.36	75.95	9.75	7.78	9	Fed in a pen, each bird having about 5 square feet floor space.
No. 3. Average weight $2\frac{3}{4}$ lbs. each...	35.25	35	46.2	11	4.2	32	48	*$5\frac{1}{2}$	48.02	8.72	94.22	16.5	5.71	11	Fed for the first two weeks in the fattening crate from the trough only; the last ten days by the machine.
No. 4. Average weight $2\frac{3}{4}$ lbs. each ...	34	34	46.2	11.25	4.11	27	27	6	35.64	5.94	81.84	17.25	4.74	10	Fed in the fattening crates from the trough only.
No. 20. Average weight $4\frac{1}{3}$ lbs. each...	47.5	48	62.75	11.5	5.45	40	40	6	52.80	8.8	115.55	17.5	6.60	10	Fed in the fattening crates from the trough only.
No. 21. Average weight $4\frac{1}{3}$ lbs. each ...	44	48	63.36	11.75	5.39	44	66	11	66	6	129.36	22.75	5.68	11	Fed in the fattening crates the first two weeks from the trough only; last 10 days from the machine.
No. 22. Average weight $4\frac{1}{3}$ lbs. each...	41	41	54.12	8.5	6 367	26	28	4	34.32	8.58	88.44	12.5	7.07	9	Fed in a pen, each bird having about 5 square feet of floor space.

* One bird in this group died, apparently not being able to stand feeding by the machine.

Conclusions.

From the above, it will appear that a chicken weighing about $3\frac{1}{2}$ pounds is the most desirable for feeding purposes.

It is also evident that the plan of putting chickens into crates for fattening is to be

Fig. 19.—A well set up Minorca Cockerel that the photo does not do justice to

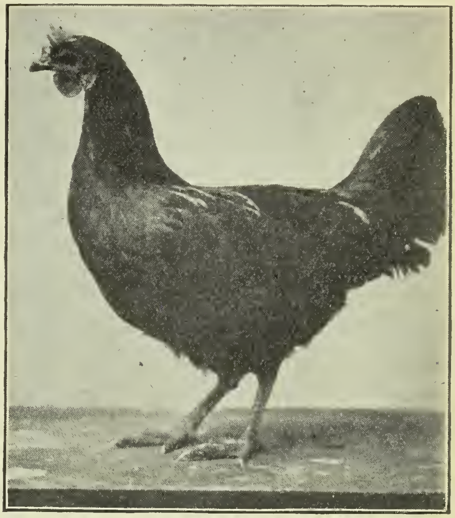


Fig. 20. Minorca Pullet that bids fair to outdo her dam. (See Fig. 18).

commended; and, further, that by using a cramming machine a bird can be finished or made to present a finer appearance when dressed than by feeding of its own accord.

It was also shown that the crated birds, and those fed by the machine in addition, were far more profitable than those fed loose.

Some experiments have also been conducted where a supply of roots was added to the grain ration. The results thus far obtained seem to indicate that there is no advantage in feeding roots. Potatoes, however, give an extra amount of gain in flesh, and at a moderate cost may be regarded as an economical food.

The following extract from a letter will give some idea of the quality of the chickens we have fatted:—

"I must say that in my long experience of over forty years, I have never met with any man who can turn out poultry in so good a condition as the chickens I have had from your College. They are a credit to you in every respect, both feeding, color, killing etc. I only wish I could get 500 or 1,000 people at different points in Canada to turn out poultry in the same fashion. I would be too glad to have the opportunity of taking all they would have.—J. Ruddin.

I may add that Mr. Ruddin is one of the largest poultry and game merchants in Liverpool.

What we have accomplished is within the reach of any person who will take a little trouble in feeding, killing and plucking their chickens.

We are carrying over to the first of the year a much greater number of chickens than in any previous year. This has been necessary owing to the establishment of the Poultry School, as it will be advisable in giving instruction to students in fattening chickens, for each to have an opportunity to feed a crate or more of fowl through the whole fattening period. We have also on hand a number of good pure bred cockerels and

pullets. These are being held with the view of disposing of them to farmers and others as breeders. It would indeed seem a pity to fatten and kill such birds. These two factors having necessarily made the revenue somewhat less than had been expected early in the year.

To give an idea of the stock on hand now as compared with that on hand last year, the following list is given :—

Variety.	1899.			1900.			1901.		
	Cocks.	Hens.	Value.	Cocks.	Hens.	Value.	Cocks.	Hens.	Value.
			$ c.			$ c.			$ c.
Barred Plymouth Recks	3	36	38 00	56	100	135 00	76	150	196 00
White Plymouth Rocks .	1	9	10 00	2	12	14 00	15	31	37 00
Buff Plymouth Rocks...	1	6	7 00	1	9	10 00	5	21	25 00
Silver-Laced Wyandottes	1	9	10 00	3	18	20 00	2	8	10 00
White Wyandottes	4	9	12 00	6	15	19 00	1	10	11 00
Langshans	1	6	7 00	1	6	7 00	3	21	20 00
Black Minorcas.........	1	10	11 00	8	18	22 00	10	39	40 00
Brown Leghorns	2	10	12 00	7	11	15 00	2	18	16 00
White Leghorns........	1	9	10 00	7	14	18 00	10	20	25 00
Andalusians	2	8	10 00	9	22	27 00	11	32	43 00
Light Brahmas	2	10	12 00	5	22	26 00	1	14	15 00
Dorkings..............	1	3	4 00	2	6	8 00	1	5	5 00
Houdans	1	3	4 00	1	3	4 00	1	3	4 00
Orpingtons	....	....	....	1	2	3 00	1	3	4 00
Grades	....	76	30 40	150	128	111 20	125	138	105 20
Ducks :	Drakes	Ducks		Drakes	Ducks		Drakes	Ducks	
Pekin	2	8	10 00	3	7	10 00	2	6	8 00
Cayuga	....	....	....	1	5	6 00	3	9	12 00
Rouen	....	....	....	1	2	3 00	1	3	4 00
Indian Runner	....	....	....	1	1	2 00	1	3	4 00
Grade	....	3	1 50	....	3	1 50	....	3	1 50
Total	23	215	$188 90	265	410	$471 70	271	536	$585 70

My many thanks are due to the heads of the other departments, who have rendered kindly assistance in many ways.

Respectfully submitted,

W. R. GRAHAM,

Manager of Poultry Department

PART XIII

REPORT OF THE LECTURER ON APICULTURE.

To the President of the Ontario Agricultural College :

Sir,—I have the honor to submit herewith a brief report upon the work done in the Department of Apiculture for the year 1901.

Instruction. Since the College closes in April, it is impossible to give *practical* instruction in bee-keeping, because only a few students stay at College during those months which chiefly concern the bee-keeper, viz, May, June and July. However, a hive is kept on the lawn during the first part of the fall term, and as much practical work is got out of that as the weather and season permit. The greater part of the teaching is given in the class room and, since bee-keeping is as much of an art as a science, it is rather difficult to reproduce to the mind of the student the various manipulations that the bee-keeper goes through. However, by means of the blackboard and the appliances at my command, I try hard to show the classes the way to manage an apiary from the middle of April, through the "building up" and swarming seasons until early autumn, when preparations for wintering commence. The lectures are of value chiefly to those who have already become interested in bees. They supplant their more or less hazy and erroneous impressions by more positive knowledge.

If twenty five dollars were expended in appliances, the instruction could be made more practical.

Experiments.

Controlling the Fertilization of Queens. For years, bee-men have been trying to mate their virgin queens with whatever drones they choose to select. D. A. Jones established queen rearing stations upon the islands of the Georgian Bay—a separate island for each race of bees. Coition always takes place in mid-air, and then the queen drops to the ground; and in such case, whenever it happened over water, the queen was invariably drowned. Some have tried buildings of netting and also of glass; but queens and drones fly directly to the netting or glass and devote their whole attention to getting out, without seeing each other. Last July, I made the following experiment. I placed a large carboy of glass, neck downwards, and introduced two virgin queens into it. As they were flying up the glass sides of the carboy trying to get out, a dozen drones which were in a cage were introduced also. The drones immediately fluttered up the glass to the queens above and coition took place. This experiment was tried with eight queens in all and seven were fertilized. The eighth may not have been virgin before being introduced into the carboy.

A little patience is sometimes necessary. When drones do not see a queen, the drones and queens must be shaken down to the bottom of the carboy, so as to induce them again to flutter up the glass; and when drones and queens are flying with their wings almost touching, coition is almost sure to take place.

The Utilization of Partially Filled Sections.

The experiment made last year in feeding back sections that were not saleable was further carried on this summer. This experiment consisted in laying by a certain number of supers containing unfinished sections, dividing them into two equal parts and placing the one half of them upon hives to be filled up from the other half which were fed back after the manner of the Boardman feeder.

This year after the third super had been fed to a colony, the bees became laggy, and finally refused to work, and in one case they capped over the sections in the feeder, plainly shewing that they took the feeder and hive to be all one hive. To overcome this, I placed a pile of supers containing unfinished sections one hundred yards from the bee-yard and almost closed them up, leaving an aperture large enough to admit only one bee at a time. Some of the caps of the sections were smashed, and bees from the hive to be

fed placed upon them. They carried stores from these supers to their hive and brought back other bees. In time, bees from other colonies discovered these supers too ; but, curiously enough, the bees from the first hive treated them as robbers and kept them out of the supers. The colony got over its laziness, soon emptied the supers, and placed the stores thus obtained in the sections on their hive, and all but about five per cent. of these sections were well built out.

Respectfully submitted,

H. R. ROWSOME,

Apiarist.

PART XIV.

REPORT OF THE PHYSICIAN.

To the President of the Ontario Agricultural College.

SIR :—I have the honor of presenting to you my report for the year now closing.

During the winter months we had, as usual during that season, a good deal of sickness amongst the students. Some of the cases were of a serious character and required much attention. I may mention especially two cases of rheumatism and one of lobar pneumonia. All, however, made good recoveries.

A large number of students remained at the College during the summer, and for these and the female help, I did considerable work. Besides giving medical attendance to those who were ill, I vaccinated many of the students who went to the military camp in June.

The autumn term opened with a record breaking attendance, but in common with the rest of the community, the general health of the students has, so far, been unusually good. At one time we seemed threatened with a serious invasion of mumps. Two cases occured, but by prompt isolation of patients and thorough disinfection of rooms, we succeeded in preventing further spread of the disease.

During the summer there were made in the building, alterations by which eighteen new rooms were added to the dormitories. These rooms are all comfortable, well lighted and well ventilated apartments. In this connection may I remark that, in my opinion, the large increase of resident students necessitates additional bath-rooms, and that some improvements might be made in those now in use.

In closing I desire to thank you for setting apart a room for the use of the College Physician. This has filled a long felt want, and has already proved of great advantage to all interested.

Respectfully yours,

W. O. STEWART,

College Physician.

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TWENTY-THIRD

ANNUAL REPORT

OF THE

Agricultural and Experimental Union

1901.

(*PUBLISHED BY THE ONTARIO DEPARTMENT OF AGRICULTURE, TORONTO.*)

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AGRICULTURAL AND EXPERIMENTAL UNION,

1901.

To the Honorable John Dryden, Minister of Agriculture :

Sir,—I have the honor to present herewith the Twenty-Third Annual Report of the Ontario Agricultural and Experimental Union.

Respectfully submitted,

C. A. ZAVITZ,
Secretary.

Ontario Agricultural College,
Guelph, December 31st, 1901.

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1901-1902

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THE AGRICULTURAL AND EXPERIMENTAL UNION.

ANNUAL MEETING.

The twenty-third annual meeting of the Ontario Agricultural and Experimental Union was held at the Ontario Agricultural College on Monday and Tuesday, December 9th and 10th, 1901.

The President of the Union, Mr. T. H. Mason, Straffordville, Ontario, presided over the three day sessions ; Miss Laura Rose, Guelph, Ontario, presided at the Ladies' Session, and Dr. James Mills acted as Chairman at the evening session, and also at the annual banquet.

TREASURER'S REPORT.

By Prof. H. L. Hutt, Agricultural College, Guelph, Ont.

Receipts.		Expenditure.	
Balance from 1900	$ 55.30	Agricultural experiments	$ 680.21
Membership fees	139.00	Horticultural experiments	225.75
Government grant	1,400.00	Poultry experiments	16.10
		Part expenses annual meeting, 1900	99.70
		Part expenses annual meeting, 1901	76.00
		Meeting of Executive	16.15
		Salary of Secretary	205.00
			$1,318.91
		Balance on hand	275.39
	$1,594.30		$1,594.30

We, the undersigned Auditors, beg leave to say that we have examined the accounts of the Treasurer and have found them correct.

T. G. Raynor.
Elmer Lick.

December 1st, 1901.

SECRETARY'S REPORT.

By C. A. Zavitz, B.S.A., Agricultural College, Guelph, Ont.

The reports, papers and discussions given at the annual meeting of the Experimental Union for 1900 were prepared for publication and sent to the Ontario Department of Agriculture in January, 1901. The material was printed in Toronto, and filled a volume of 63 pages. As there were about 25,000 copies of the report printed it will be seen that the results of the Union work were brought very prominently before the farmers of Ontario.

Three meetings of the Board of Control have been held since the last annual meeting of the Experimental Union, two in December, 1900, and one in October, 1901.

At our last annual meeting a committee was appointed to interview the Hon. John Dryden, Minister of Agriculture for Ontario, asking that the grant to the Union be increased in 1901 from $1,200 to $1,500. The members of this committee attended to their appointment, and were instrumental in having the grant of the Union increased from $1,200 to $1,400 for the present year.

In 1901, co-operative experiments were conducted throughout Ontario in agriculture, in horticulture and in poultry raising. The summary results of these experiments conducted on upwards of 3,000 Ontario farms within the past year, will be presented and discussed at the different sessions of this meeting.

The Experimental Union was never in a more thriving condition than it is at the present time. The membership is larger than ever before, the experimenters are deeply interested in the work, and new and important lines of co-operative work are opening up. We are greatly pleased that the public press, not only of Ontario, but also of other Provinces of the Dominion, is taking so much interest in our co-operative work and is reporting the results of this work so fully through the columns of the agricultural journals and the principal papers of the Dominion. We are greatly pleased to have at this meeting press representatives from London, Guelph, Toronto, Ottawa, Montreal and Winnipeg. The Experimental Union certainly has good ground for encouragement in pressing onward with its good work.

PRESIDENT'S ADDRESS.

By T H. Mason, Staffordville, Ont.

We meet to-day under favorable circumstances. The country is in a good financial condition, and the great basic industry of agriculture is more prosperous than it has been at any time during the last decade.

The opening of the new century is a favorable time to consider our position as agriculturists and to form plans for greater success and usefulness in the future. Now we know that we are meeting with the most strenuous competition in the markets of the world, and that the signs all point to that competition becoming more intense in the future, and, while not underestimating the value of cheap and improved transportation and perfected cold storage to the markets of the world, still we must all admit that the very essence of successful agriculture rests upon large crop production. When we reflect that the cultivated area of Ontario now reaches nearly 13,000,000 acres, and that if by the introduction of improved methods and better varieties we could increase the average yield to the value of the very trifling sum of 50 cents per acre we can see something of the possibilities and value of the work of our Union to the Province. The Minister of Agriculture and the Legislature have in the past recognized the value of this work, and our thanks are tendered to them for the increased grant that was made to the Union last session.

The Union was primarily intended as a bond among the students and ex-students of the O.A.C., but while fulfilling its original purpose it has developed into an "experimental extension movement," widening and extending the work of this Experimental Station to all parts of the Province, and proving the adaptability of the work done here to the different sections of Ontario. New fields are opening to this work, a New Ontario is being entered upon, and new problems are pressing upon us for solution. The zone of successful agriculture and horticulture is ever widening in this Province, and by the introduction of early ripening and hardy varieties of cereals and fruits from Northern Europe we may render a service to the pioneers of Northern Ontario which can hardly be overestimated. Much work has been accomplished in the past and that work has been done at a very small cost to the country at large.

G. C. Creelman : In my official capacity as superintendent of Farmers' Institutes, I come in contact with farmers in every part of Ontario, and I find that thinking farmers in all parts of the Province are of the opinion that no work has done so much to increase the yield of our farm crops as the work caried on by this Union. This is a justification not only for the expenditure involved in maintaining this Union but for the entire cost incurred in carrying on the whole work of the Agricultural College.

CO-OPERATIVE EXPERIMENTS IN AGRICULTURE.

By C. A. Zavitz, B.S A., Director of Experiments, Agricultural College, Guelph.

The co-operative experimental work was started in Ontario in 1886, with twelve experimenters. In 1901 there were upwards of 3,000 Ontario farmers conducting the co-operative tests upon their own farms. The average number of experimenters each year for the four years ending with 1889 was 73; with 1893, 557; with 1897, 2,059, and with 1901, 3,157. The experiments were located in both New Ontario and Old Ontario, and on small farms as well as on large farms, and the experimenters themselves comprised men and women, highly educated and self-educated, old and young, married and single, rich and poor, who did the work for their own good and for the good of others.

Both the financial and the educational influences of this work throughout Ontario are great. The benefits are not confined to the experimenters themselves, but are shared by thousands of others who examine the growing crops, who attend the annual meetings, who read the annual reports, or who become familiar with the results through the columns of the public press, in the meetings of the Farmers' Institutes and in various other ways.

The letters and reports which are received from experimenters throughout Ontario show the keen interest which is taken in the work, and indicate something of the influences of these experiments in the various localities where they are carried on. The following quotations are taken from letters and reports just received :

Ten thousand people saw my experiment.—Charles Wilson, Peel County.

Fully a thousand people were looking at the plots when the crops were growing.—J. V. Brownrigg, Prescott County.

I believe four thousand people saw my experiment, and many useful lessons were learned. I feel well repaid for my work.—W. H. Davison, Bruce County.

Farmers who experiment are always to the front. About one thousand people saw my experiment this year.—W. B. Ogden, Rainy River District.

My experimental plots gave a great object lesson in agriculture, and farmers came regularly to watch the progress of the experiment.—D. Dwyer, Wentworth Co.

The only way to find out which varieties of farm crops will give the best results is to grow them side by side.—D. Buchanan, Kent County.

My experimental work is of great educational value to me.—Cyrus D. Lawrence, Parry Sound District.

The experimenters deserve great credit in successfully conducting the various experiments during the past season, and the farmers of Ontario owe much to these experimenters for the valuable reports which they have furnished, the summaries of which are to be here presented.

The following circular was sent out in the spring of the present year, and gives the list of experiments as well as other information regarding the work :

CIRCULAR OF CO-OPERATIVE EXPERIMENTS IN AGRICULTURE.

Dear Sir,—The members of the Ontario Agricultural and Experimental Union are pleased to state that for 1901 they are again prepared to distribute into every Township of Ontario material for experiments with fertilizers, fodder crops, roots, grains, grasses, and clovers. Upwards of 1,200 varieties of farm crops have been tested in the Experimental Department of the Ontario Agricultural College. Guelph, for at least five years in succession. These consist of nearly all the Canadian sorts and several hundred new varieties, some of which have done exceedingly well in the carefully conducted experiments at the College, and are now being used for co-operative experiments throughout Ontario.

This system of co-operative experimental work in Agriculture was started in 1886 with 60 plots, which were situated on twelve different farms in Ontario. Since that

date, however, the work has increased from year to year, and in 1900 there were 8,335 plots, which were situated on 3,363 farms throughout Ontario.

Each person in Ontario who wishes to join in the work may choose any one of the experiments for 1901, fill out the accompanying form of application and return the same to the Director of the Co-operative Experiments in Agriculture at as early a date as possible. The material will be furnished in the order in which the applications are received until the supply is exhausted. A sheet containing the instructions for conducting the chosen experiment, and the blank form on which to report the results of the work, will be sent to each experimenter at the time the fertilizers or seeds are forwarded. All material will be furnished entirely free of charge to each applicant, and the produce of the plots will, of course, become the property of the person who conducts the experiment. In return, the Committee on Agricultural Experiments desires to ask that each experimenter will sow all the plots belonging to the particular experiment which he has chosen for 1901, and that he will be very careful and accurate in his work, and forward to the Director a complete report of the results obtained from the test, as soon as possible after the plots are harvested.

All fertilizers and seeds will be sent in good time for spring seeding, providing the applications are received at an early date. The supply of material being limited, those who apply first will be surest of obtaining the desired outfit. It might be well for each applicant to make a second choice, for fear the first could not be granted. The experiment selected should be indicated by using its number as given in the left hand column in the list of experiments. Further information is given on the application form which is enclosed.

LIST OF EXPERIMENTS FOR 1901.

Grain Crops.

1—Testing three varieties of Oats	2
2—Testing three varieties of six-rowed Barley	3
3—Testing two varieties of Hulless Barley	2
4—Testing Spelt and two varieties of Spring Wheat	3
5—Testing two varieties of Buckwheat	2
6—Testing three varieties of Field Peas for Northern Ontario	3
7—Testing two varieties of bug-proof Field Peas	2
8—Testing Cow Peas and two varieties of Soja or Japanese Beans	3
9—Testing three varieties of Husking Corn	3

Root Crops.

10—Testing three varieties of Mangels	3
11—Testing two varieties of Sugar Beets for stock feeding	2
12—Testing three varieties of Swedish Turnips	3
13—Testing Kohl Rabi and two varieties of Fall Turnips	3
14—Testing Parsnips and two varieties of Carrots	3

Forage, Fodder, Silage and Hay Crops.

15—Testing three varieties of fodder or silage Corn	3
16—Testing three varieties of Millet	3
17—Testing three varieties of Sorghum	3
18—Testing Grass Peas and two varieties of Vetches	3
19—Testing Dwarf Essex Rape and two varieties of Kale	3
20—Testing three varieties of Clover	3
21—Testing Sainfoin, Lucerne and Burnet	3
22—Testing five varieties of Grasses	5

Culinary Crops.

23—Testing three varieties of Field Beans	3
24—Testing three varieties of Sweet Corn	3

Fertilizer Experiments.

25—Testing fertilizers with Corn	6
26—Testing fertilizers with Mangels	6

Miscellaneous Experiments.

27—Growing Potatoes on the level and in hills	2
28—Planting Potatoes the same day and five days after being cut	2
29—Planting Cut Potatoes which have and which have not been coated over with land plaster	2
30—Planting Corn in rows and in squares (an excellent variety of Early Corn will be used)	2

The size of each plot in each of the first twenty-six experiments is to be two rods long by one rod wide; in Nos. 27, 28 and 29 one rod square; and in No. 30 four rods square (one-tenth of an acre).

Some Advantages of the Co-Operative Experiments.

1. Farmers who conduct these co-operative experiments in their own fields with varieties of farm crops, methods of cultivation, ways of increasing soil fertility, etc., obtain valuable information which they cannot possibly get in any other way.

2. The Union furnishes a good method by which farmers can secure pure seed of the best varieties of grain, root, fodder, silage and hay crops to test on their own soils, and thus find out in a very practical way which special kinds are best suited to their own particular farms.

3. Experimental work encourages careful handling, close observation, accurate calculation and economical methods.

4. Experimenters get a start in pure seed of the best varieties of grain crops which rapidly increases in quantity, thus furnishing seed for sowing on large areas and for selling at good prices.

5. The co-operative experiments located on over three thousand Ontario farms form object lessons for the farmers in their respective neighborhoods.

6. Farmers are frequently enabled to purchase pure seed of leading varieties of grain from their neighbors who are successful experimenters.

7. Summary results and important conclusions from successfully conducted co-operative experiments are printed annually in the report of the Experimental Union, which is distributed in large numbers from the Department of Agriculture, Toronto, Ontario.

8. Important features of the experiments are frequently discussed in the field, at the fireside and in the meetings of farmers' institutes.

9. Results of experiments conducted by other farmers and by the Experiment Stations are read and studied with increased interest.

10. Properly conducted experimental work adds pleasure to farm life and forms a very wholesome influence in keeping the boys on the farm.

11. The whole system leads to a substantial increase in farm profits and to a steady advance in agricultural education throughout Ontario.

In order to keep the work systematized and in the clearest form possible, an application form for experimental work was sent with each circular, with a request that those who were desirous of conducting experiments during the coming season fill out the form of application and return it to the College at the earliest convenience. The following circular, which furnishes some information about the experiments, and a blank form for applying for experimental material was used in the spring of 1901 :

Dear Sir,—If you wish to conduct ONE of the thirty agricultural experiments named on the accompanying circular, kindly fill out this blank form and return it as soon as possible.

The distribution will be confined to the choice varieties included in the various experiments. In filling out the blank form, therefore, it is neither necessary nor advisable to mention any particular variety or varieties.

Material for either number 25 experiment or number 26 experiment will be sent by express, and for each of the others it will be forwarded by mail.

Address all communications to C. A. ZAVITZ,
Agricultural College, Guelph, Ont.

Application for Material for an Experiment.

I would like to conduct experiment number ...., but if all the material for that experiment has been applied for before my application is received I select experiment number .... as my second choice. If the material for one of these two experiments is forwarded to me, I will endeavor to

1. Carry on the test according to the instructions received with the seed,
2. Exercise care and accuracy in the work, and
3. Report the results of the experiment as soon as possible after harvest, whether successful or not.

Name .... Post Office .... Express Office .... Line of Railway........
County ,....... Date of mailing ....

No varieties were sent out except those which had done exceptionally well in the trial grounds in the Experimental Department. As the reports are received from the various experimenters they are examined very carefully, and all those which show any signs of inaccuracy in any way whatever are discarded. For the summary re-

port, nothing but the results which were obtained from carefully conducted experiments were used. Every report which showed that the experimenters did not conduct the experiment with the full amount of material, did not use plots of uniform size and according to instructions, did not give the exact yield, etc., produced on the different plots, was placed to one side and was not used in making the summary, which is here presented. While these summaries should be of great value to the farmers generally, still those who conducted the experiments obtained much additional information regarding the results of their experiments as adapted to their individual circumstances, which it is impossible to convey in a concise report of this kind.

REPORTS OF THE EXPERIMENTS.

The following are the average results of the co-operative experiments successfully conducted over Ontario in 1901 :

GRAIN CROPS.

Experiments.	Varieties.	Comparative value.	Yield per acre. Straw. (tons)	Yield per acre. Grain. (bush.)
1. Oats (102 tests)	Siberian	100	1.3	42.2
	Improved Ligowa	88	1.2	40.5
	Daubeney	52	1.1	36.9
2. Six Rowed Barley (17 tests)	Mandscheuri	100	1.0	29.1
	Oderbrucker	86	1.1	27.8
	Success	53	.9	22.8
3. Hulless Barley (22 tests)	Black Hulless	100	1.5	20.1
	White Hulless	73	1.4	14.8
4. Spring Wheat (39 tests)	Emmer (in Ontario called Spelt)	89	1.5	24.1
	Goose Wheat	100	1.3	16.5
	Herison Bearded	97	.9	14.0
	Blue Democrat	86	1.3	13.7
	Medeah	73	.8	10.7
5. Buckwheat (2 tests)	Japanese	100	4.2	28.2
	Silver Hull	100	4.3	21.9
6. Peas (27 tests)	Early Britain	100	8	18.3
	Grass Peas	81	1.1	17.6
	White Wonder	100	.8	17.2
7. Bug Proof Peas (51 tests)	Grass Peas	100	.9	18.9
	Egyptian Peas	69	.6	16.2
8. Soy Beans (13 tests)	Early Yellow Soy Beans	100	1.5	21.4
	Medium Green Soy Beans	86	2.2	18.1
			wh crop	
9. Corn for Grain (19 tests)	North Star Yellow Dent	90	9.3	48.3
	King Phillip	100	8.0	46.2
	Compton's Early	98	9.0	43.6
			straw	
31. Winter Wheat (81 tests)	Dawson's Golden Chaff	100	1.6	27.5
	Diamond Grit	86	1.5	25.1
	Early Genesee Giant	43	1.6	24.2
	Stewart's Champion Red	64	1.7	23.8
	Turkey Red	22	1.6	23.8

Each experimenter was asked to give the relative value of each variety as the result of the experiment conducted on his own farm. In the first column of figures, therefore, in the table here presented, the highest results of the comparative value of the different varieties are given, 100 representing the most popular variety in each

experiment. The yield of straw as here reported means the total crop less the amount of grain, and this would, of course, include the chaff or the husks with the straw or the stalks. The yields of grain are given in numbers of bushels per acre by weight, and not by measure. The weights per measured bushel used in this determination are as follows : Oats, 34 lbs.; six-rowed barley, 48 lbs.; Hulless barley, 60 lbs.; spring wheat, 60 lbs.; buckwheat, 48 lbs.; peas, 60 lbs.; Soy beans, 60 lbs.; corn, 56 lbs., and winter wheat, 60 lbs.

Oats. It will be seen from the results here presented that the Siberian variety of oats occupies first place among the three varieties in popularity and in yield of grain per acre. The Siberian oats also occupied first place in yield of grain per acre in the average results of 125 experiments in 1892, 105 experiments in 1893, 121 experiments in 1894, 78 experiments in 1895, 106 experiments in 1898, 107 experiments in 1899 and 97 experiments in 1900; and it occupied second place in yield of grain per acre in 1896 and in 1897. Not only has the Siberian variety, therefore, given good results at the Agricultural College, but it has also made a very excellent record throughout Ontario. In each of the past two years each experimenter was asked to sow an extra plot with the variety of oats which had proven the best in his past experience. The American Banner variety was used as the extra variety by 16 experimenters in 1900, and also by 16 experimenters in 1901. In taking the average results of these different experiments in each of the two years we find that the Siberian gave 2.6 bushels per acre more than the American Banner in 1900, and 2.0 bushels per acre more in 1901. It will, therefore, be seen that the Siberian has not only given a larger yield of grain per acre than that produced by the American Banner in the average results of twelve years' experiments at the Agricultural College, but it has also given a larger yield in the co-operative experiments over Ontario in each of the years that these varieties have been tested with each other.

Six-rowed Barley. The Mandscheuri barley gave the largest average yield of grain per acre in the comparative tests over Ontario in each of the years 1892, 1893, 1894, 1895, 1896, 1897, 1898 and 1901, and the second largest average yield of grain per acre in 1899 and in 1900. The Oderbrucker barley has given the second largest average yield of grain per acre in the comparative tests over Ontario in each of the years 1892, 1893, 1894, 1895, 1896, 1897, 1898 and 1901, and the largest average yield of grain per acre in 1899 and in 1900. It will, therefore, be seen that the Mandscheuri variety gave better results than the Oderbrucker in each of eight years, and that the Oderbrucker surpassed the Mandscheuri in each of two years. The Success variety has given decidedly the lowest yield per acre in the cooperative experiments in each of the three years during which it has been used.

Hulless Barley. Previous to 1900 no distinct experiment was conducted with Hulless barley, but one variety of Hulless barley was included with the six-rowed barleys for the barley experiment. In 1899 the Black Hulless barley gave a less yield per acre than either of the three six-rowed barleys tested over Ontario. In the results for 1900, it was found that the Black Hulless gave the largest yield of grain per acre of the three varieties of Hulless barley under experiment, and that it was the most popular variety with the experimenters. In the results for 1901, it will be seen that the Black Hulless variety surpassed the White Hulless barley by fully 5 bushels per acre. The White Hulless barley, which is also beardless, has been advertised very extensively within the past few years.

Spring Wheat. In all, five varieties of spring wheat were used for the co-operative experiments in 1901. These represent three different classes of wheat, two varieties being grown principally for the production of flour, two for the production of macaroni, and one as a food for stock. In the average results of thirty-nine tests, the various varieties showed marked differences in the comparative yields of grain per acre. The Emmer, which frequently goes under the name of Spelt, or Speltz, in this country, stands at the head of the list, with an average yield of 24.1 bushels of grain per acre. In determining the yields per acre, 60 pounds was taken as the standard for each variety

of grain, even though the Emmer usually weighs only about 44 pounds per measured bushel. In threshing the Emmer, the heads break up into sections, and there is not a separation of chaff and kernel. The threshed grain, therefore, contains about 22 per cent. of chaff. It will be understood by this, that, although there are 24.1 bushels per acre credited to the Emmer in the table of results, still there is in reality only about 18.8 bushels of the pure grain, less the chaff. Even this yield is about two and a third bushels per acre greater than the average yield of grain produced by the Wild Goose variety. The Wild Goose spring wheat is grown largely for export to France and Italy for the manufacture of Macaroni, and the price for this variety has been usually good within the past few years. The Herison Bearded and the Blue Democrat are the two varieties grown more specially for the production of flour. All the varieties of spring wheats gave comparatively low results in the co-operative experiments of the past year.

Buckwheat. In 1899 and again in 1900, three varieties of buckwheat were distributed for experimental purposes. In 1901, however, only two varieties of buckwheat were used for the co-operative tests. Although the Japanese variety gave an average of 6.3 bushels more than the Silver Hull variety, still it will be seen from the figures given in the table that the Silver Hull was as popular among the experimenters as the Japanese variety. In taking the average results over Ontario for three years of these two varieties, it is found that the Japanese produced 2 bushels per acre more than the Silver Hull variety.

Peas. Previous to 1900, there was only one experiment with peas, but in the spring of that year it was thought advisable to make two distinct experiments. Therefore, three large yielding varieties were selected for one experiment irrespective of their weevil (Bruchus pisi) resisting qualities, and two varieties were selected for another experiment, these having been comparatively free from the ravages of the pea weevil in the experiments at the College. In 1901, a somewhat similar arrangement was made, with the exception that in the experiment with three varieties, one weevil-proof variety was included. As the result of placing these two experiments on the list, nearly all experimenters who asked for the large yielding varieties were located in the Northern part of Ontario, where the pea weevil does but little damage, while nearly all those who applied for the bug-proof varieties were those located in the Southern part of Ontario, where the pea weevil has been doing so much serious damage of late. In the results for 1900 it was found that the Grass peas, and in the results for 1901 it was found that the Grass peas and the Egyptian peas, or Coffee peas, were entirely free from the ravages of the pea weevil. We have found in our own experiments at Guelph that both the Grass peas and the Egyptian peas have been entirely free from the injuries of the weevil. The Egyptian pea is known under a good many different names, such as the Brazilian Coffee Pea, Chick pea, Idaho pea. New Gipsy pea, etc., the scientific name being Cicer arietinum. The Grass peas gave 2.7 bushels per acre more than the Egyptian peas in the results for 1901. The Egyptian variety is only suitable for rich land, but the Grass peas do very well on an average soil as well as on a rich soil.

Soy, Soja, or Japanese Beans. The Soy bean is a leguminous plant, native of Japan and China, and ranks very high in valuable food constituents. The plants grow upright, branch considerably, and frequently drop their leaves by the time the seed is ripened. The Soy beans are used for green fodder, silage, hay, pasture, and as a soil renovator. The grain, which is exceedingly rich, is used as a food for live stock. The beans have been used for the food of man since early times in Japan, and more recently in European countries. They are not generally used as a food by themselves, but are made into different complex forms, of which five are quite common among the Japanese people. Some of the leading varieties of the Soy beans have now been distributed throughout Ontario for three years in succession for co-operative experiments, and the results have been quite satisfactory. In 1899 and in 1900 the Medium Green, American Coffee Berry, and Extra Early Dwarf were the three varieties distributed. The average results show that the Medium Green variety gave the largest yield of grain in each of the two years. In 1901, only two varieties were distributed, the Medium Green for the

third time, and the Early Yellow variety for the first time. In the average results of thirteen experiments in 1901, the Early Yellow variety produced 3.3 bushels of grain per acre more than the Medium Green. The Early Yellow variety usually ripens well, and is one of the very best varieties of the Soy beans for the production of grain. For the production of green fodder or for silage, however, the Medium Green is likely to give better satisfaction, owing to its more luxuriant growth and greater development of leaf. In those parts of Ontario where the pea weevil is becoming so abundant as to practically ruin the pea crop, the Soy bean might be grown to great advantage.

Corn for Grain. In each of the past two years different varieties of corn have been distributed and tested throughout Ontario from the standpoint of grain production. Each experimenter was asked to weigh the total crop of each variety and then to husk, dry, thresh, and weigh separately the grain produced by each kind of corn. Two varieties of flint and one variety of early dent were distributed in each of the two years. The North Star Yellow Dent corn made a very high record in the average results of each year's co-operative tests, producing an average of 59.9 bushels of grain per acre in 1900, and 48.3 bushels per acre in 1901. The North Star Yellow Dent variety produced an average yield of corn which was 11.4 bushels per acre greater than that of the Comptons' Early in 1900, and which was 4.7 bushels per acre more than Compton's Early in 1901. Combining the two year's experiments, we find that the varieties stand in the following order in their yield of grain per acre: 1. North Star Yellow Dent. 2. King Phillip. 3. Salzer's North Dakota. 4. Compton's Early.

Winter Wheat. The results of the co-operative experiments with winter wheat were reported as soon as possible after the crop was harvested, in order that the information might prove of service before the time of sowing wheat last autumn.

Root Crops.

Experiments.	Varieties.	Comparative value.	Yield of Roots per acre. (tons)
10. Mangels (6 tests)	Evans' Improved Mammoth Sawlog	100	40.04
	Carter's Yellow Intermediate	87	29 27
	Carter's Warden Yellow Globe	60	24 66
11. Sugar Beets (15 tests)	New Danish Improved	100	27 30
	Klein Wanzlebener	50	22.26
12. Swedish Turnips (5 tests)	Kangaroo	82	28.26
	Sutton's Magnum Bonum	100	27.47
	Hartley's Bronze Top	82	25.91
13. Kohl Rabi and Fall Turnips. (2 tests)	Cow Horn Turnip	100	22.40
	Jersey Navet Turnip	67	14 80
	Early W. Vienna Kohl Rabi	33	9.20
14. Parsnips and Carrots (7 tests)	Bruce's Mammoth Intermediate Carrot	100	30 67
	Half Long White Carrot	79	28 49
	Improved Half Long Parsnip	50	19.31

There were five distinct experiments with root crops in 1901, and from two to fifteen good reports of successfully conducted tests were received for each experiment.

Mangels. For the experiment with mangels, the varieties which had given the largest yields per acre in the long red, the intermediate, and the globe classes were distributed for co-operative experiments. The Evans' Improved Mammoth Saw Log variety, which has given high results both at the Agricultural College and in the co-operative experiments over Ontario in former years, stands at the head of the list with an average of 40 tons per acre. This variety was quite popular among the experimenters. The average yield of the Evans' Improved Mammoth Sawlog in 1899 was 31.8 tons, and in 1900 was 33.6 tons per acre.

Sugar Beets for Feeding Purposes. Previous to 1900, one variety of sugar beets was included in the experiment with mangels, but it was thought advisable in 1900 to make a distinct experiment, and, therefore, two varieties from among some thirteen different kinds which had been tested at the Agricultural College were selected for the co-operative tests. For that year, the Danish Improved and the White Silesian were used, and the results show that the yield per acre of the two varieties was practically the same, but that the Danish Improved was more popular than the White Silesian in the estimation of the experimenters. In 1901, the Danish Improved and the Klein Wanzlebener were the two varieties included in the co-operative tests. The Klein Wanzlebener is a variety that is very rich in sugar, and is the one which has been used in the tests over Ontario in growing beets to be analyzed for sugar purposes. These two varieties in the Union experiments for 1901 were grown for agricultural purposes. The roots were grown in rows 25 inches apart, and the plants were thinned to a distance of 10 inches apart in the rows. In the average of fifteen tests, the New Danish Improved gave 5 tons per acre more than the Klein Wanzlebener. The last named variety, however, gave an average of 7 tons per acre more than is usually considered a very good yield of this variety when grown strictly for sugar production.

Swedish Turnips. The results of the experiments with Swedish Turnips for 1901 were somewhat different from those of 1900. The Sutton's Magnum Bonum, which occupies second place in 1901, came first in yield of roots per acre in 1900. In the average of the two year's results, the Sutton's Magnum Bonum gave a little higher yield per acre than either the Kangaroo or the Hartley's Bronze Top.

Kohl Rabi and Fall Turnips. Kohl Rabi was sent out for co-operative experiments in 1901 for the first time. This crop is used for culinary purposes and also as a stock food in some parts of Great Britain. The cultivation suitable for Kohl Rabi is very similar to that necessary in the growing of turnips. In the average results for 1901, the Cow Horn turnip gave decidedly the best results.

Parsnips and Carrots. Previous to 1901, three varieties of carrots were used for this experiment, but in the spring of the past year, it was decided to use, along with two varieties of carrots, a variety of parsnips which has given us the best results at the College. The Bruce's Mammoth Intermediate Carrot was distributed in 1901 for the first time, and surpassed the Pearce's Half Long White variety in yield of roots per acre. It will be remembered that the Pearce's Half Long White carrot has made high records in the co-operative experiments of past years.

Forage, Fodder, Silage and Hay Crops.

Experiments.	Varieties.	Comparative value.	Yield of Whole Crop per acre (tons.)
15. Fodder Corn (10 tests.)	Mastodon Dent	96	18 7
	Wisconsin Earliest White Dent	100	15.3
	North Star Yellow Dent	96	13 7
16. Millet (2 tests.)	Japanese Panicle	100	12.7
	Japanese Barnyard	88	11.9
	Hungarian	38	9.7
17. Sorghum (3 tests.)	Early Amber	100	10.1
	Millo Maize	50	9 9
	Kaffir Corn	50	6 8
18. Grass Peas and Vetches (4 tests.)	Hairy Vetch	100	7 1
	Common Vetch	80	5.0
	Grass Pea	60	4 7

FORAGE, FODDER, SILAGE AND HAY CROP.—(*Con.*)

Experiment.	Varieties.	Second years crop. Tons of Green Clover per acre. 6 tests.	Second years' crop. Tons of dry hay per acre. 9 tests.
20. Clover	Mammoth Red	7.3	4.0
	Common Red	6.0	2.1
	Alsike	5.6	2.6

Experiment.	Varieties.	Average height about six months after seeding, 2 tests. (inches.)	Second years' crop, tons of dry hay per acre. 1 test.
21. Perennial Crops	Lucerne	10.5	4.4
	Sainfoin	12.5	1.9
	Burnet	11.0	1.4

Experiment.	Varieties.	Second season's crop. Tons of hay per acre. 7 tests.	3rd and 4th seasons' crop. Tons of hay per acre. 4 tests.
22. Grasses	Tall Oat Grass	2.8	3.1
	Timothy	2.7	1.8
	Orchard Grass	1.9	1.6
	Meadow Fescue	2.2	1.5

There were in all eight distinct experiments with forage, fodder, silage, and hay crops conducted throughout Ontario in 1901.

Fodder Corn. The Mastodon Dent has been found to be one of the best silage corns for the early soils in Southern Ontario. The Wisconsin Earliest White Dent has given excellent satisfaction as a silage corn in central Ontario, and the North Star Yellow Dent variety appears to be very well suited as a silage corn for many districts of Northern Ontario. Although there was a considerable amount of difference in the average yield per acre in the tests of the three varieties of corn, it will be seen that the three varieties were about equal in popularity.

Millet. The Japanese Panicle millet has now headed the list in the co-operative experiments over Ontario for three years in succession, except in 1900, when the yield of the Japanese Barnyard Millet was the same as that of the Japanese Panicle variety.

Sorghum. Although a large number of varieties of sorghum have been under experiment for several years at the Agricultural College, no co-operative experiment was conducted with different varieties of sorghum until 1901. Although the Early Amber Sugar Cane produced only one-fifth of a ton per acre more than the Millo Maize, the Sugar Cane was decidedly the most popular among the experimenters.

Grass Peas and Vetches. The Hairy Vetches, Common Vetches, and Grass peas are all leguminous crops, and, therefore, like clover and peas, are valuable as nitrogen gatherers. These varieties have been distributed for co-operative experiments for three years in succession, and the Hairy vetches have given the largest yield of green crop per acre in each of the three years. The Hairy vetches surpassed the Common vetches in yield of green crop by 2.1 tons per acre in 1899, nearly 1 ton per acre in 1900,

and 2.1 tons per acre in 1901. It will be seen that the Grass peas are not only valuable for grain production by their being proof against the weevil, but they are a good variety for green fodder purposes.

Rape and Kale. The Dwarf Essex Rape and two varieties of Kale were distributed in 1901 for co-operative experiments, but no satisfactory reports of carefully conducted experiments were received. The Dwarf Essex variety of Rape is the one which has given the best satisfaction at the Agricultural College.

Clover. The average results for the clover as given in the table here presented is for the first crop in each year, the second crop of clover not being included. It will be seen from the average yield of the first cutting that the Mammoth Red Clover has given decidedly the largest yield of green crop and of hay per acre.

Sainfoin, Lucerne, and Mammoth Red Clover. An additional experiment was added to the list in 1900, which included three perennial legumes. We hope to be enabled to present some valuable results of this experiment in future reports.

Grasses. The results given for the different varieties of Grasses are for the second, third, and fourth season after the seed had been sown. No second crop in any one season is included in the average results here given. Of the four different grasses under test, the Tall Oat Grass has produced the largest crop per acre.

Culinary Crops.

Experiment.	Varieties of Beans.	Comparative value.	Yield per acre.	
			Straw. (tons.)	Grain. (bushels.)
23. Beans (10 tests.)	Marrowfat	100	2.1	26.7
	Medium or Navy	88	2.1	25.5

Experiment.	Varieties of Sweet Corn.	Table quality.	Comparative number of ears.	Number of days until ready for table use.
24. Sweet Corn (27 tests.)	Mammoth White Cory	100	93	86
	Country Gentleman	85	100	99
	Kendal's Early Giant	80	85	85

Two experiments were conducted in 1900 and again in 1901 with culinary crops.

Field Beans. Ten good reports were received in the autumn of 1901, giving the comparative results of the Marrowfat and the Medium or Navy varieties of beans. The Medium or Navy variety did not give as large a yield in comparison with the Marrowfat variety as it usually does. In the majority of experiments, both at the College and throughout Ontario, the Medium or Navy beans have yielded a little more than the Marrowfat variety.

Sweet Corn. All three varieties of sweet corn were quite popular among the experimenters. The Kendel's Early Giant proved to be slightly the earliest, the Country Gentleman gave the largest number of ears, and the Mammoth White Cory was the most popular of the three varieties. These are all good varieties for the production of green corn for table use.

FERTILIZER EXPERIMENTS.

Fertilizer.	Quantity per acre fertilizer used.	Bushels of oats per acre, 5 years, 74 tests.	Average yield per acre.					
			Tons of mangels.		Corn per acre.			
					Total crop (tons).		Ears (tons).	
			1901, 5 tests.	Average 5 years, 41 tests	1901, 2 tests.	Average 5 yrs., 40 tests.	1901, 2 tests.	Average 5 yrs., 35 tests.
	lbs.	bus.						
No fertilizer	none.	38.9	22.52	20.58	10.36	8.1	2.06	2.96
Nitrate of soda	160.0	46.3	35.32	26.54	10.88	9.1	2.42	3.30
Muriate of potash	160.0	43.8	28.86	24.55	10.92	9.1	2.18	3.32
Superphosphate	320.0	43.6	27.33	24.20	10.88	8.9	2.18	3.32
Mixed fertilizer	213.3	48.7	34.09	25.37	10.88	9.1	2.32	3.40

NOTE.—The cost price of the fertilizers was between three and four dollars per acre for the quantities used in these tests.

The superphosphate and the muriate of potash were applied to the land at the time of planting, and the nitrate of soda at the time that the plants were about three inches high. The mixed fertilizer consisted of one part nitrate of soda, one part muriate of potash, and two parts of superphosphate by weight.

Fertilizers With Mangels and Corn. Different fertilizers were used on both mangels and corn crops in connection with the co-operative experiments of the past year. As this experiment has been conducted on somewhat similar lines for ten years in succession, we not only present the results for the past year, but also the average results for fertilizers used with oats, mangels, and corn, each for five years in succession. The results of this experiment, as presented in the table here given, are worthy of careful study.

MISCELLANEOUS EXPERIMENTS.

Growing potatoes on the level and in hills.

Experiment.	Method of Cultivation.	Comparative value.	Yield per acre.	
			Percentage marketable.	Whole crop. (Bush.)
27. Potatoes, 45 tests ..	Potatoes grown on level	89	87	197.8
	Potatoes grown in hills	100	88	189.3

Planting potatoes the same day and five days after being cut.

Experiment.	Time of planting.	Comparative value.	Percentage of crop marketable.	Yield of whole crop per acre. (Bush.)
28. Potatoes, 11 tests ..	Potatoes planted immediately after cutting	100	85	120.1
	Potatoes planted five days after cutting	67	84	111.8

Planting cut potatoes which have and have not been coated with land plaster.

Experiment.	Treatment of cut seed.	Comparative value.	Percentage of crop marketable.	Yield of whole crop per acre. (Bush.)
29. Potatoes, 15 tests ..	Cut potatoes coated with land plaster....	100	76	190.5
	Cut potatoes not coated with land plaster	76	77	176.1

Planting corn in rows and in squares.

Experiment.	Method of planting.	Comparative value.	Yield per acre.	
			Husked ears. (Tons.)	Whole crop. (Tons.)
30. Corn, 7 tests	Corn planted in squares or hills	100	3.7	11.5
	Corn planted in rows or drills............	64	3.7	10.4

Growing Potatoes on the Level and in Hills. A co-operative experiment to test the comparative results from growing potatoes on the level and in hills was conducted over Ontario in 1901 for the first time. In the average results of forty-five full reports of carefully conducted experiments, it is found that the potatoes which were grown on the level gave a total yield per acre of 16½ bushels more than those grown in hills. These results are very similar to the results obtained at the College in testing the two methods of cultivation. The experiment will likely be repeated another year.

Planting Potatoes the Same Day and Five Days After Being Cut. This experiment has been conducted for several years at the Agricultural College and for five years over Ontario, and the average results have been very similar in all experiments. As a rule, the potatoes which have been cut and planted on the same day have given from 10 to 20 bushels per acre more than those which have been cut and planted from four to six days after being cut, the average for the five years over Ontario being about 17 bushels per acre in favor of immediate planting.

Planting Cut Potatoes which have and which have not Been Coated over with Land Plaster. This experiment has now been conducted throughout Ontario for two years in succession. The average results show that the potatoes which were sprinkled with land plaster gave an increase of 16.4 bushels per acre in 1900, and an increase of 14.4 bushels per acre in 1901 over those on which no land plaster was used. This experiment has also been conducted for five years at the Agricultural College. It was found in the College experiments that cut potatoes which were coated with land plaster also gave better results than those on which no land plaster was used.

Planting Corn in Rows and in Squares. An experiment has now been conducted over Ontario for three years in succession, in which corn has been planted in rows three inches apart, and, in comparison with this, corn has been planted in squares or hills three inches apart both ways. Exactly the same amount of corn was used for each method. Flat cultivation was used throughout, and the same amount of cultivation was given to each method of seeding. The corn which was planted in squares, or "hills," surpassed the corn which was planted in rows, or drills, in total yield per acre by 1.2 tons in 1899, 1.6 tons in 1900, and 1.1 tons in 1901. In yield of ears per acre, the squares surpassed the rows by ½ ton per acre in 1899, and ⅕ ton per acre in 1900, but the results were equal in this respect in the average tests for 1901. These results throughout are in favor of planting corn in hills as compared with drills.

Q. : What is the weight per measured bushel of the Siberian oats ?

C. A. Zavitz : The average weight per measured bushel of the Siberian oats, as grown at the College for the past ten years, is about 36 pounds.

Q. : You mentioned that the Siberian oats gave about 2 bushels per acre more than the American Banner in 1901, and about 2½ bushels per acre more than the American Banner in 1900. Do some of the farmers use other varieties than the Banner as a basis of comparison ?

C. A. Zavitz : Yes, nearly all the experimenters sowed an extra plot with the best variety which they have been growing in the past, as was advised in the instructions. In summarizing the results, we find that the best variety which the Union distributed gave upwards of 5 bushels per acre more than the best varieties which were grown on the farms on which the experiments were conducted.

W. K. Farlinger : Conditions vary in different localities. The variety of oats which give the best results on high-rolling land might not give the best results on the level land.

C. A. Zavitz : That is true, and hence the great value of the local experiments, which will show better than any other way which are the best varieties for the different conditions of soil and locality. We do not expect that the varieties will be equally serviceable under all conditions. In selecting varieties for distribution, one of the chief objects is to combine in those varieties various characteristics, so that one or the other might prove very serviceable on any soil, and we naturally expect that the variety which gives the best results on one soil will be surpassed by another variety on a soil entirely different.

Q. : What variety of oats would do best for sowing with barley for grain production ?

C. A. Zavitz : If you take a variety of heavy yielding oats which is medium in reaching maturity, such as the Siberian, you would need to sow with them a late variety of barley, such as the Chevalier two-rowed, which makes an excellent mixture. If you take a medium ripening barley, however, such as the Mandscheuri, it is necessary to secure a very early ripening oat, such as the Daubeney, in order that they will ripen at the same time. Both of the mixtures here mentioned have given splendid results at the College.

Q. : How does the yield of the Mandscheuri barley compare with that of the Black Hulless variety ?

C. A. Zavitz : In the average of eight or ten years' experiments, the Mandscheuri barley has produced about one-third more pounds per acre than the Black Hulless variety.

J. H. Cole : The Hessian Fly is causing serious havoc in our barley crops in my section. Have you found much difference in the different varieties in resisting the attacks of the Hessian fly ?

C. A. Zavitz : We had no Hessian fly in the barley until the past summer. Even then there was not enough of the fly for us to make any determinations as to the comparative value of the different varieties in resisting the ravages of the Hessian fly.

Q. : How do the Grass peas compare with the Golden Vine as a nitrogen gatherer ?

C. A. Zavitz : The Grass pea is a leguminous plant, and I think would be about the same as the Golden Vine variety in drawing nitrogen from the atmosphere.

Mr. Wilson : The Grass pea ripened more evenly in my section than the other varieties.

C. A. Zavitz : On uniform land the Grass peas are usually pretty uniform in their growth, but on land which is uneven there are sometimes difficulties in parts of the field ripening earlier than other parts. The Grass pea is rather slow in reaching maturity.

Q. : At what time do you plant the Soy beans ?

C. A. Zavitz : We usually plant the Soy beans about the 5th of May.

Q. : How are the Soy beans usually planted ?

C. A. Zavitz : The seed should be sown in rows and the crop cultivated. The Soy bean is being used considerably in some of the Eastern States by dairymen who wish to secure very rich food for their animals. It is also beginning to be grown quite extensively in some of the Western States, particularly Kansas. The crop will serve admirably as a substitute for peas in those sections where the pea weevil is doing so much damage.

Dr. Saunders : Our experience with Japanese Millet is that the stems are not equal to other millets for feeding purposes.

E. M. Zavitz, Coldstream, Ont. : We have grown this Japanese millet for several years, and would not go back to the other varieties of millet, because we get twice the quantity of fodder, and more than twice the quantity of grain. After the Japanese millet ripens and we thresh it for the seed, the farm stock will eat the straw with relish.

Q. : How much grain do you get per acre ?

E. M. Zavitz : From 25 to 30 bushels on gravelly soil.

A Member : We get about the same amount in the West.

A Member : I find the Japanese millet does well on poor soil, but I grew it and cultivated it like corn, and it is well adapted to a light sandy soil.

Mr. Glendinning : I tried to grow the Japanese millet on very rich land, but did not meet with good success.

Q. : How does Amber Sugar cane compare with corn for feeding purposes and for the silo ?

C. A. Zavitz : It is somewhat richer, but I have had no experience in making silage from Sugar Cane.

Dr. Saunders : We tried sorghum in the silo, but with us it has always blackened. In some seasons, it will give a good crop, but our experience with it was unfavorable in the Ottawa District. It will not compare favorably with corn in a good year. We have had no success in keeping it in the silo. Perhaps it did not ripen well ; that has a great deal to do with the keeping quality.

Mr. Drummond, Ontario Co. : We have had three years' experience with it in the silo. This year we had twenty tons on top of the corn. We find it to be very successful, and that it keeps in the silo about as well as corn.

Dr. Saunders : Was it the same variety here referred to ?

Mr. Drummond : Yes, the Amber Sugar Cane. We had 50 per cent. more by weight than from corn. Our experience is that it keeps about as well as corn, but the sugar cane silage does not make quite as good food as the corn silage.

Mr. Fixter : We fed sugar cane to pigs last year with very good results.

T. H. Mason : I know of a farmer who has fed it to horses very successfully.

A Member : A man near me had nine acres of sugar cane. He made syrup out of it. Six acres yielded 117 gallons of molasses to the acre.

Q. : Last year we saw something about cattle being poisoned on sorghum.

C. A. Zavitz : We heard of a little trouble from pasturing sorghum in the Western States last year. I made enquiries regarding it, and from what I could glean there need not be much fear on this account. Some farmers in the West have pastured sorghum for several years with excellent results. Sorghum can be used for many purposes. It can be pastured, used as a green or a dry fodder, put in the silo, ripened for the grain, or used for the production of molasses.

Q. : Is the grain of equal value with other grains for feeding ?

C. A. Zavitz : The grain is quite starchy, but I think would be nearly equal to corn for feeding purposes.

Mr. Van Adam : Cow peas grow well with sorghum and give good results in the silo.

Dr. Saunders : The Awnless Brome Grass is a wonderfully good grass for the Northwest, yielding about $3\frac{1}{2}$ tons of hay to the acre at Indian Head. I do not know whether it would be as good for Ontario, but it has done very well at Ottawa.

C. A. Zavitz : We have grown the Awnless Brome Grass at the College for a number of years, but have not found that this Grass gives as good results as it seems to give in the West.

A Member: We have had it on our farm for 25 years and wish we could get rid of it.

Dr. Saunders: I do not think that there is much trouble in getting rid of it, if it is plowed at the right season. I saw an irrigated crop near Calgary that was running from 3 to 3½ tons per acre. It seems to succeed better in the West, under adverse conditions, than any grass we have ever tested.

Q.: Has the black sweet corn been tested?

C. A. Zavitz: The Black Mexican sweet corn has been grown at the Agricultural College for several years. It was also distributed as one of the three varieties for co-operative experiments in 1900. It is a very fine corn, of good flavor and very juicy. If the ears are taken when quite young, the black color does not show much.

Mr. Caston: Have you found very marked benefit from using fertilizers with mangels?

C. A. Zavitz: Taking the average of our experiments for five years over Ontario, we find that the use of 160 pounds of nitrate of soda per acre has increased the yield of mangels 6½ tons per acre. This is one of the most striking effects in connection with our fertilizer experiments. The cost of the 160 pounds of nitrate of soda per acre was about $3.80.

Dr. Saunders: The results of the co-operative experiments in growing potatoes on the level and in hills correspond very nearly with the results at Ottawa. We have given up growing our field potatoes in hills. Taking one year with another, the resutls were better from the level cultivation.

Mr. Fixter: At what stage was the hilling done?

C. A. Zavitz: The experimenters were allowed to hill the potatoes as they had been in the habit of hilling potatoes in previous years. No definite time being mentioned in the instruction sheets as to when the hilling was to be done.

Dr. Saunders: It has been a surprise to me for some years to know how small the average potato crops in Ontario are in comparison with the yields obtained at Ottawa. It seems to point to the fact that Ontario has not a very favorable climate for the production of potatoes. We have a good deal more moisture in the Ottawa valley than in many parts of Western Ontario. That may be the principal cause for the reason of the difference in the yields.

C. A. Zavitz: I think the large amount of moisture in the Ottawa valley has a good deal to do with the large yields of potatoes grown at Ottawa. I have noticed that several crops can be grown in the Ottawa valley better than in almost any other part of Ontario. For instance, I have found no place in Ontario where the Horse beans proved successful one year with another, except in two or three counties along the Ottawa valley, where the Horse beans usually give very good results.

Hon. John Dryden: In the experiment in planting potatoes immediately and five days after they were cut, how were the cut potatoes kept during the five days?

C. A. Zavitz: We thought it advisable to give the experimenters no definite instructions along this line, but allow each to keep the cut potatoes as he thought best. Each experimenter was requested to state in his report the number of hills of potatoes which grew from each lot of potatoes planted. Unless the number of hills were practically the same in both cases, the results were not used for the summary report which is here presented.

Dr. Saunders: I take the greatest interest in this Association. I think it one of the best in existence in securing valuable information. We are all interested along the same lines, and I wish to say that if any one here would like the reports from Ottawa, they could get them, free of charge. I think they will find many things in the reports that will be useful to the people of Ontario.

C. A. Zavitz: We all appreciate very much Dr. Saunders' remarks regarding the Union, and also his liberality in offering to supply the ex-students and other farmers from over Ontario who are here assembled with the reports of the Dominion Experimental Farm. We all want to secure the best information we can get from different

sources, and I would advise all to get all the reports issued at Ottawa, and make the best use possible of the results of the experiments there presented.

While much has been said regarding the value to the Province of the results of the co-operative experiments, I hope none will get the impression that the financial results of the co-operative work are the only benefits obtained therefrom. I consider that the educational influences of these co-operative experiments are even greater than the influences of the experiments from a financial standpoint. The educational training in the carrying out of these experiments has a very beneficial influence not only upon the experimenters themselves, but also upon their families, their neighbors, and their fellow-farmers generally. People find out that by a little work and care in conducting experiments along definite lines, they obtain a special training and definite information which cannot be obtained in any other way, and which is of the utmost importance to them in their future work. In the sixteen years that we have been conducting the co-operative experiments in agriculture throughout Ontario, and during which time I have been closely connected with this work, I have been greatly pleased with the interest which has been taken in this work by the farmers generally, some of whom undoubtedly took but little interest at first, but afterwards developed into careful and enthusiastic experimenters, and obtained results which were of great value not only to themselves but also to others. On behalf of the Union, I wish to thank the experimenters most heartily for the excellent work which they have done for the good of themselves and for the Province generally.

REPORT ON CO-OPERATIVE EXPERIMENTS WITH SMALL FRUITS.

By Prof. H. L. Hutt, Ontario Agricultural College, Guelph.

The wonderful progress that has been made in fruit growing in this country of recent years is a subject well worthy of note. The time is still fresh in the memory of many of our people when the pioneer plantings of any considerable extent were made. These were naturally in the older sections, bordering the shores of Lakes Ontario and Erie, and along the St. Lawrence and Niagara Rivers. In the newer and interior sections the people depended upon the wild fruit, found in more or less abundance, or, failing that, they went without it.

The first plantings were mostly apple and pear trees, but after a time it was found that the more tender fruits, even grapes and peaches, could be grown to perfection in the Southern sections. Plantings of all kinds of fruits became general, and they spread into all parts of the country. Now this might well be called a land of "corn and wine," of "milk and honey," of "peaches and cream" ; in fact, a hundred more appropriate names than the land of the "Lady of the Snows."

The display made this year at the great Pan-American Exposition, and also at the Glasgow Exhibition, has helped to open the eyes of the world at large to our capabilities in the way of producing a great variety of fruits of superior excellence.

At the Pan-American, our exhibit was pronounced first in quality and second only to New York in variety.

We now produce annually over three million barrels of apples in this Province alone, and our shipments to the Old Country markets are assuming enormous proportions. Efforts are now being made to perfect the means of transportation, that we may place on British markets in good condition our more luscious tender fruits. One evening last fall I helped load at the Grimsby station two carloads of Bartlett pears, which were being shipped to the Glasgow market. Several other car-loads were shipped from the same place this season, and these are only a beginning of what will be sent as soon as complete systems of cold storage can be secured on both railroads and ocean steamships.

The fruit industry in Ontario is now one of the most important industries of the Province, and it is growing fast. The Government has recognized its importance, and has established fourteen Fruit Experiment Stations in various parts of the Province, to enable growers to find out what are the best varieties of the different kinds of fruits for each particular section, that they may waste no time and expense in growing inferior or worthless varieties. These stations are doing good work, and the results of these tests are giving fruit growers just the information needed.

The Experimental Union also has been helping on the work by introducing a system of co-operative experiments with small fruits. This work was begun eight years ago with sixty experimenters, and every year since then it has been steadily increasing, until now we have on our books the names of about one thousand experimenters located in different parts of the Province, who have been carrying on these tests with small fruits on their own farms. Our co-operative experiments are helping to encourage the growing of small fruits on many farms throughout the country, where they have not been grown before. During the time we have been engaged in this work, we have distributed 2,256 currant bushes; 3,220 gooseberry bushes; 3,600 blackberry plants; 4,440 black raspberry plants; 4,440 red and white raspberry plants ; and 25,008 strawberry plants, or a total of 42,964 plants. This large number of plants of the leading varieties distributed in small lots all over the Province is having its influence in encouraging the growing of fruits by farmers generally, and we hope it will hasten the time when all of our people will know the satisfaction of having a good supply of fruit for home use throughout the year.

The following circular, sent out early in the spring of the present year, gives the list of experiments, as offered to experimenters this year :

Co-Operative Experiments in Horticulture.

Dear Sir,—Through the agency of the Experimental Union, arrangements have again been made for furnishing plants for a number of co-operative experiments with small fruits.

The varieties for the several experiments offered this year are as follows :

I. Strawberries—Clyde, Haverland, Saunders, and Van Deman—12 plants of each.
II. Raspberries—Cuthbert, Golden Queen, Marlboro', and Shaffer—6 plants of each.
III. Black Raspberries—Gregg, Hilborn, Palmer and Souhegan—6 plants each.
IV. Blackberries—Agawam, Gainor, Kittatinny, and Snyder—6 plants of each.
V. Currants—Fay, Raby Castle, Victoria, and White Grape—3 plants of each.
VI. Gooseberries—Downing, Pearl, Red Jacket, and Whitesmith—3 plants of each.

Each person wishing to join in the work, may do so by choosing one of the experiments, and signing the agreement contained in the accompanying form of application. The experiment selected may be indicated by number. It is well for each applicant to make a second choice, in case he may be too late for the first. The supply being limited, plants will be furnished in the order in which the applications are received ; those who apply promptly will be most likely to receive what is asked for.

Instructions for conducting the tests will be sent to each experimenter before the plants are mailed, and blank forms will be furnished from year to year, upon which to report the results. All will be furnished free of charge, and the plants and produce become the property of the experimenter. In return, we expect that each experimenter will follow the instructions given, and will report each year, as requested, upon the growth and yield of each variety under test.

These plants are purchased from nurserymen at considerable expense, and as the funds at our disposal for this purpose are limited we can seldom furnish plants to more than half of those applying for them. We would like, therefore, that they go to those only who will make an honest effort to make the experiment a success, and we trust no one will apply for plants unless he is prepared to make such an effort, and will report the results as requested.

Trusting that your interest in the work may lead you to become a successful experimenter,

H. L. Hutt.
Director of Co-operative Experiments in Horticulture.

The following form of application, which is sent with the circular offering plants for testing, states the terms upon which the plants are sent out. It is in reality an agreement on the part of the experimenter to follow the directions given and report results :

Application for Plants for Co-Operative Experiments in Horticulture.

Dear Sir,—Kindly forward to me the plants for the experiment which I have selected as indicated below. If my application is received in time to entitle me to them, I agree

1. To conduct the experiment according to directions furnished.
2. To look after the plants and exercise care and accuracy in reporting the results.
3. To report upon the growth and yield of each variety at the end of each season as requested.

Name..

Post Office..

County...

Experiment chosen 1st choice...

(Indicate by Number) 2nd choice..

(This sheet, when filled out and returned by mail, will require 2c. postage whether the envelope is sealed or not.)

As soon as the list of experimenters for the year could be made up, the following circular was sent out informing applicants that they might expect the plants in due time, and giving general directions for conducting the experiments. Accompanying this was a sheet giving special cultural directions for the particular experiment chosen :

Dear Sir,—I am pleased to inform you that your application for plants for co-operative testing was duly received, and that the plants will be forwarded to you as soon as the weather is suitable for planting. If they cannot be planted as soon as they are received they should be unpacked, so that the roots may be spread out and buried in moist earth ; but the sooner they can be permanently planted, the better.

The soil upon which they are to be planted should be as uniform as possible, so that all varieties may have an equal chance.

As soon as planted, each variety should be carefully labelled. Stout wooden stakes painted white, written on plainly with a lead pencil, and driven firmly into the ground answer the purpose well. It is advisable, also, to make a record of the planting in a notebook, in case a label should at any time be lost.

I trust you will follow the directions carefully, and that you will not allow poultry or trespassers to interfere with the fruit. The weight of the entire crop from each variety is one of the most important items desired in your annual report; and, in order that this may be given accurately, it will be necessary for you to carefully weigh and record each picking, so that the total yield of each variety may be reported at the end of each season. Blank forms will be mailed to you in due time each season, upon which to make such report.

The value of this experiment depends largely upon the attention given to it. I trust you will find it both interesting and profitable. From this small collection of plants you may, in time, by good management, propagate for yourself all the plants you wish, without interfering with the value of the experiment in the least.

Should you require any further information regarding the work, kindly let me know and I shall be pleased to give all the assistance possible.

The Strawberry Experiment.

1. Prepare the land deeply and thoroughly, working in, if necessary, a liberal application of barnyard manure.,

2. Set the plants in rows, at least 4 ft. apart and about 18 inches apart in the row. If two or more varieties are planted in the same row, leave a space of at least 3 ft. between them to avoid mixing of the runners.

3. The best method of planting is to use a spade. thrusting it deeply into the ground, then pressing it backwards and forwards. Into the opening thus made. spread out the roots fan-shaped, and pack the soil firmly about them with the foot.

4. Give clean, thorough cultivation throughout the season, and never allow the soil to become crusted.

5. Pinch off all blossoms the first season, that the plants may make vigorous growth and not waste their energies trying to produce fruit.

6. Confine the runners of each variety to its own row, allowing them to form matted rows about a foot and a half wide. If any of the plants should die, place the runners of the adjoining plants so that they will fill up the spaces.

7. As soon as the ground is frozen in the fall, cover the whole plantation with two or three inches of strawy stable manure. When danger of frost is over in the spring, rake the coarsest of this covering off the plants and tread it down between the rows for a mulch. If it is not thick enough to keep down weeds and retain moisture, more may be added at any time in the spring.

8. To continue the experiment from year to year, a similar plantation should be set out each spring, taking a dozen new plants of each variety from the plots set out the year before. The old plots may be plowed up after the second crop is off.

9. Carefully weigh and record the weight of each picking from each variety, and report as soon as possible after the fruiting season.

The varieties of strawberries sent out last spring were: Clyde. Haverland, Saunders, and Van Deman.

These were sent to 116 experimenters, only one-half of whom have as yet reported. The majority of those reporting say that much difficulty was experienced this season in getting a good stand of plants. The best results come from the northern and eastern sections of the Province, where they had not the extreme drouth which prevailed in the southern and western sections.

The varieties sent out a year ago were Clyde, Haverland, Saunders, and Glen Mary. Thirty-five experimenters report this year on the yields obtained. In some places one variety has done best, and in other places near by another leads ; but, on the whole, the Clyde has made the best showing. Haverland also did well, and is highly spoken of by many of the experimenters.

Each of the varieties has its good qualities, and they are all well worthy of a place in any collection for home use or market.

The Red Raspberry Experiment.

1. Prepare the land deeply and thoroughly, working in, if necessary, a liberal application of manure.

2. Plant in rows 5 or 6 feet apart, with plants 5 feet apart in the row.

3. Give clean, thorough cultivation until about the beginning of August, and never allow the soil to become crusted.

4. Pinch off any blossoms which may form the first year, that the plants may not waste their energies trying to produce fruit.

5. Do not allow the varieties to become mixed by letting the suckers grow between the bushes.

6. In the fall, or early in the spring, cut out all old canes that have fruited, and leave about six of the strongest new canes to each bush. Shorten the ends of these to a uniform height, making the bushes uniform and symmetrical.

7. In northern localities, where winter protection is needed, bend down the canes late in the fall, and cover the tops with earth to keep them under the snow.

8. Should any spaces have to be filled, or should the experimenter wish to increase his stock of any of the varieties, it may readily be done by taking up the young suckers which spring up about the bushes. Shaffer is propagated by bending down and covering the tips of the new canes in August. They will make good plants by the next spring.

9. Carefully weigh and record the weight of each picking from each variety, and report as soon as possible after the fruiting season.

For this experiment, the varieties selected were Cuthbert, Golden Queen, Marlboro' and Shaffer. Thirty-five lots of plants were sent out last spring and twenty reports have been received this fall upon the growth of the plants. Nearly all report good success with the planting, most of them speak of the great vigor of growth of the Shaffer. Twenty-two experimenters report upon the yield of the same varieties sent out in previous years. Shaffer is conceded by nearly all to be the heaviest yielder of the lot. This is one of the purple varieties, a very desirable one for home use, but not such a favorite in the market as some of the lighter colored berries. Cuthbert comes second

in point of yield. This is a firm, bright red berry, that has long been known as the Queen of the market. The Golden Queen is much like the Cuthbert, except that the fruit is yellow. Marlboro' ranks last for yield, but it is the first to ripen its fruits. These four varieties cover the season well from early to late, and make an excellent selection for home use or market.

The Black Raspberry Experiment.

1. Prepare the land deeply and thoroughly, working in, if necessary, a liberal application of manure.
2. Plant in rows 5 or 6 feet apart, with plants 5 feet apart in the row.
3. Give clean, thorough cultivation until about the beginning of August, and never allow the soil to become crusted.
4. Pinch off any blossoms which may form the first year, that the plants may not waste their energies trying in produce fruit.
5. To make the bushes stout and stocky, pinch off the ends of the new canes during the early summer, when they are two or three feet high.
(In northern localities, where winter protection is needed, this should not be done, as the canes should grow long and slender, that they may be more easily laid down.)
6. In the fall, or early in the spring, cut out all old canes that have fruited, and leave about six of the strongest new canes to each bush. Shorten the ends of these to a uniform height, making the bushes uniform and symmetrical.
7. In northern localities, where winter protection is needed, bend down the canes late in the fall, and cover the tops with earth to keep them under the snow.
8. Should any spaces have to be filled, or should the experimenter wish to increase his stock of any of the varieties, it may readily be done by propagating new plants from the tips of the new canes, which should be bent down and covered with earth in August. They will make good plants by the next spring.
9. Carefully weigh and record the weight of each picking from each variety, and report as soon as possible after the fruiting season.

The varieties included in the Black raspberry test are Gregg, Hilborn, Palmer, and Souhegan. Thirty-five experimenters received plants this spring, and twenty-four report this fall upon them. On the whole, black raspberries have not lived so well as the reds, but most of the experimenters have some of all kinds living, and can easily propagate from these what more they need.

Twenty-two reported upon the fruiting of plants sent out in previous seasons. There is a good deal of difference in the results reported, but Hilborn and Palmer appear to have been the most productive.

To ascertain definitely just which is the best black cap for any particular section seems to be a difficult matter, as the varieties vary so much in different seasons. We have been testing about two dozen varieties at the College here during the past five years, and every year some new variety appears at the head of our list as having made the best yield. Last year Hilborn and Palmer were ahead, and this year it was Eureka and Gault.

The Blackberry Experiment.

1. Prepare the land deeply and thoroughly, working in, if necessary, a liberal application of manure.
2. Plant in rows 5 or 6 feet apart, with plants 5 feet apart in the row.
3. Give clean, thorough cultivation until about the beginning of August, and never allow the soil to become crusted.
4. Pinch off any blossoms which may form the first year, that the plants may not waste their energies trying to produce fruit.
5. To make the bushes stout and stocky, pinch off the ends of the new canes during the early summer, when they are two or three feet high.
(In northern localities, where winter protection is needed, this should not be done, as the canes should grow long and slender, that they may be more easily laid down.)
6. In the fall, or early in the spring, cut out all old canes that have fruited, and leave about six of the strongest new canes to each bush. Shorten the ends of these to a uniform height, making the bushes uniform and symmetrical.
7. In northern localities, where winter protection is needed, bend down the canes late in the fall, and cover the tops with earth to keep them under the snow.

8. Should any spaces have to be filled, or should the experimenter wish to increase his stock of any of the varieties, it may readily be done by taking up the young suckers which spring up about the bushes.
9. Carefully weigh and record the weight of each picking from each variety, and report as soon as possible after the fruiting season.

The varieties tested in the Blackberry Experiment were Agawam, Gainor, Kittatinny, and Snyder. Thirty-five experimenters received plants last spring and twenty report this spring on the success of their planting. A few lost one or more plants, but most of the experimenters report all plants living.

Fifteen reports have been received from the plants sent out previous years.

Blackberries are the least hardy of the bush fruits commonly grown in this country. In some sections, the plants were frozen to the ground last winter. The Snyder is reported as being the most hardy, but where the plants have suffered by winter killing, the Kittatinny has produced the largest yields and the finest berries.

The Currant Experiment.

1. Prepare the land deeply and thoroughly, working in, if necessary, a liberal application of manure.
2. Set plants five feet apart each way, in one or more rows, as convenient.
3. Give clean, thorough cultivation until about the first of August, and never allow the soil to become crusted.
4. Look out for currant worms on the lower parts of the bushes soon after the leaves are fully grown. They may be destroyed by spraying with Hellebore (1 oz. to 3 gallons of water), or Paris green (1 oz. to 10 gallons of water.)
5. Prune early every spring. A good method of pruning is to leave six inches to form the bush, then keep up a renewal of new wood by cutting out every year, two of the oldest branches, and allowing two strong new ones to take their place. Cut out all other new canes, and shorten back the new wood left nearly one-half.
6. Carefully weigh and record the weight of the crop from each variety, and report as soon as possible after the fruiting season.

The varieties of Currants in the Currant Experiment are Fay's Prolific, Raby Castle, Victoria, and White Grape. Plants were sent to thirty-eight experimenters last spring and thirty reports on the same have been received. With but one or two exceptions, all succeeded in getting every plant to live. This is a remarkably good record of planting among so many planters.

Thirty-one experimenters reported on the yield of the bushes set out in previous years. The honors for first place are pretty well divided among the four varieties ; but, on the whole, Fay's Prolific seems to be the favorite. White Grape has made a good showing, and is an excellent variety for home use ; but, like other white fruits, it does not have the demand in the market that the red varieties do.

The Gooseberry Experiment.

1. Prepare the land deeply and thoroughly, working in, if necessary, a liberal application of manure.
2. Set plants five feet apart each way, in one or more rows, as convenient.
3. Give clean, thorough cultivation until about the first of August, and never allow the soil to become crusted.
4. Look out for currant worms on the lower parts of the bushes soon after the leaves are fully grown. They may be destroyed by spraying with Hellebore (1 oz. to 3 gallons of water), or Paris green (1 oz. to 10 gallons of water.)
5. The English varieties—Industry and Whitesmith—are subject to mildew. This may to a great extent be prevented by spraying with potassium sulphide (1 oz. in two or 3 gallons of water). It should be applied early in the season, just as the buds are swelling, and five or six times afterwards, at intervals of ten days or two weeks.
6. Prune early every spring. A good method of pruning is to leave six branches to form the bush, then keep up a renewal of new wood by cutting out every year, two of the oldest branches, and allowing two strong new ones to take their place. Cut out all other new canes, and shorten back the new wood left nearly one-half.
7. Carefully weigh and record the weight of the crop from each variety, and report as soon as possible after the fruiting season.

For the Gooseberry Test the varieties selected were Downing, Pearl, Red Jacket and Whitesmith.

Fifty-two lots were sent out last spring, and thirty reports on these have been received this fall. The majority of the experimenters report very good success in planting, but quite a number lost one or more plants of Whitesmith. This is one of the English varieties, the plants of which are usualy imported from the Old Country, and thus lack the vitality and vigor of the American varieties.

Twenty-five experimenters report on the plants sent out previous to last year. By the majority Pearl and Downing are reported as the most productive, although Red Jacket has done well and has produced large berries.

Whitesmith bears the largest and finest berries, but this variety, like other English varieties, when grown in this country, is very subject to mildew.

In conclusion, I may repeat what I have said in former years, that is, the greatest value of this co-operative work is not in the brief summary presented at this annual meeting, but the greatest good naturally is obtained by the individual experimenters who carry on the experiments, and from the many reports sent in we have abundant evidence that the majority of the experimenters appreciate the work and are profiting by it.

Mr. McNeill : I agree with Prof. Hutt that there is great good in these experiments for the experimenters themselves, but I think this phase of it might be extended to the boys on the farm. If the fruit growers would endeavor to interest their small boys in conducting these experiments it would be a means of education not less valuable than that afforded at the high school. My own small boy is immensely interested in it, and knows more about fruit growing than he would have been able to gather by years of work in some other lines.

In the matter of planting strawberries I find it pays to wait a few days for favorable weather. The way for them to get a good start is to have cloudy weather for a day or two after planting. Rapid planting is also very desirable.

Mr. Sherrington : What Mr. McNeill says as to strawberry planting is correct. The plant has a small, fibrous root, and if it is exposed to the air and sun for a few minutes it becomes shrivelled and dried up, so that it is impossible to make the plant grow. The plants should be kept moist and shielded from the sun and air. I carry my plants in a sack that has been dipped in water. It is very important to press them firmly in the ground. After planting, the ground should be cultivated so that it will hold the moisture. It is, of course, important to cultivate throughout the season. There is room for much discussion on the planting of raspberries, and also as to the best varieties for different districts. Some of those sent to my district have been of no use at all for the market. Some are good for home use, but I think we should look more for the commercial berry, for that will be good for our own table also.

Mr. Robert Thompson (St. Catharines) : As regards getting our small boys interested, unless we would give our small boys the fruit, there is not much use in asking them to look after the plants. As to market varieties, I think one of the chief objects in these experiments is to get fruit among farmers who have no fruit, and to encourage by every means the people in the back counties to grow more and more fruit. About the difficulty of getting the plants to the parties early in the spring I would suggest that some of the plants could be sent to the north in the previous fall and planted out, because they do not suffer from thawing and freezing as we do in the south.

Prof. Hutt : I agree with what Mr. Thompson suggests. We have followed the plan of sending out plants in the spring because that is the usual time for planting; but our experiments at the College have been in favor of fall planting for currants and gooseberries. Last year they were set out at the end of the first week of November and with very good results. I do not think this would succeed so well with black raspberries as with red. As to the time for planting strawberries, there is quite a difference of opinion. Our experience is that it is well to hold off plant-

ing in the spring till the ground is in good shape, and the plants begin to make new growth. We usually plant about the first week in May. We find that plants set out after a little growth has been made in the spring are most vigorous and we lose very few of them. We always cut back the tips of the roots of strawberry plants brought from a distance, and if the plants are at all dried, we soak them in water for a while, and in that way save most of the plants. We watch for cloudy, showery weather for planting. Strawberry plants need very careful handling, as they are more readily injured than other plants.

Q. Have you tried planting strawberries with only a surface cultivation in the spring? They say the ground does not dry out so rapidly.

Prof. Hutt: Our practice in preparing the ground for strawberries has been to plow in the fall, apply the manure and then rib it up. In the spring the ground is worked down as soon as it is dry enough. In that way we save soil moisture from the start. I would not advocate planting without plowing in the spring unless the soil is mellow enough for the spade to go straight down, so as to allow the roots to go straight down also.

Mr. Caston, Craighurst: I think every farmer should induce some of the younger members of his family to take an interest in the fruit experiments. Too many farmers are not growing any small fruits. As to strawberry planting, I find it an important thing to trim off the runners and the old rusty leaves before planting. Do not allow the plants to bear any fruit the first year, because they require all their vitality and energy to form good plants. In blackberries I would suggest that Prof. Hutt should add the Eldorado to his list of varieties for co-operative experiments, as it is good for the northern district. I would recommend that and the Agawam. They will stand a temperature of 25 below zero, and they yield an excellent crop of choice berries.

REPORT OF CO-OPERATIVE EXPERIMENTS WITH EGG PRESERVATIVES.

By W. R. Graham, B.S.A., Agricultural College, Guelph.

In our experiments this year our experience has been somewhat different to that of last year. This year there is a diversity of opinion among the experimenters as to which is the better preservative. The highest individual score was for eggs preserved in the lime water, but when we come to the general average the conclusions are not so favorable.

We sent out twenty-one different samples of preservatives, but up to this morning I have received but nine replies from parties who were able to successfully conduct the experiment. This is not a very large percentage, but the results are valuable so far as they go.

The first experiment of the series was conducted with one part of water-glass to five parts of water. I may say that water-glass, or sodium silicate, resembles extracted honey in appearance. There are two kinds, the American and the English. The American will allow an egg to sink when diluted with five times its own bulk of water, while the English must be diluted twelve times. From drug stores you usually purchase the American article, but if you purchase from soap factories you usually get the English water-glass. The latter you will have to dilute one to twelve or one to fifteen in order that the eggs may sink. Then, if the eggs are not more than twenty-four hours old they will sink, but if they are two or three days old they will not. With American water-glass one part of water-glass to seven parts of water will give the best general satisfaction.

The lime solution used in our experiments was made by slacking two pounds of ordinary fresh lime and adding to it one pound of salt. After stirring well, add four gallons of water. This is stirred and then allowed to settle. You afterwards pour off the liquor, which is used as the preservative. Pure lime-water is practically as good as

lime-water and salt. It is necessary to cover the jar in which the pickle is put. Where it is left open to the air and disturbed once or twice in the season, you will not get good results.

In our score cards for scoring the results of the experiments, we allowed fifty points or ten for each of the following: Flavor, density of white, toughness of yolk, beating qualities, and poaching qualities.

Where eggs were put up in ordinary salt, the evaporation was equal to 33 per cent. of the contents of the egg. Where the eggs were greased, this was reduced to 25 per cent. There is no evaporation of the egg with the water-glass or lime solution. Three per cent. of the eggs put up in salt were bad, but where the eggs were greased, there were none bad.

In the experiments with water-glass, one to five, the eggs scored 44 out of a possible 50. Where the water-glass was one to seven, the eggs scored 43.2 out of 50.

With the lime and salt solution, the eggs scored 40, and in the lime-water they scored 41.

The eggs put up in salt scored 37, and the greased egg put up in salt scored 38.

Three of the experimenters scored their eggs put up in the lime water higher than any others. This solution received the highest individual score. But two experimenters report their eggs very bad in that solution. Others report these eggs to be inferior to those preserved in water-glass. While this is a first-class pickle, a great deal seems to rest with the experimenter and the carefulness with which the experiment is conducted. At the College, the eggs kept in the lime solution in the house cellar turned out favorably in every respect, except that they had a slight flavor of lime. The eggs we had in the same solution in cold-storage were all bad and mouldy on the top. I do not know whether the dampness had anything to do with it, but the eggs in water-glass in cold-storage kept very well. I think it will be necessary to continue this experiment for four or five years if we are to reach definite conclusions, as it gives very variable results. This year the worst and the best results came from the same town. I notice that with experimenters who conducted experiments with lime solution both last year and this year, the results this year are better than last.

Q.: Have you tried oil with this solution?

Mr. Graham: Yes; but it did no better with me. The lime solution with me gave good satisfaction, except in the cold storage building, but these particular eggs were gathered from the egg waggon and not from our own department, which may have had something to do with it; but they stood the candle test before pickling, which is as far as we can tell. If you pickle eggs in July without first testing them in this way you will not have many good ones. In Gunn Bros.' establishment this year, with some of the July and August eggs, eight out of ten were more or less incubated. It is hardly possible for the egg dealer to supply eggs in any other condition during the hot weather, for if they are left for three or four hours in the hot sun, 90 per cent. will have started to hatch, and are no longer suitable for pickling. No pickle made will keep those eggs.

Q.: You prefer a solution of water-glass in the proportion of one to five?

Mr. Graham: Personally I would as soon use one to seven; but eggs from the one to five solution with poach better. I got some eggs from Mr. Zavitz a short time ago that had been in pickle eighteen months, and they would poach and beat equal to eggs put up this year The solution used by Mr. Zavitz was one to eight.

Q.: What is the cost of waterglass?

Answer: English water-glass costs 65 cents per gallon, and the cost of preserving the eggs is about 1½ cents per dozen. With the American article the cost will be about two cents per dozen. There is this objection to water-glass, that, after the eggs have been immersed for two or three weeks, a milky, white coating begins to form on them. The longer the eggs are in the solution the thicker and harder the coating becomes. It can be removed, however, by placing the eggs in warm water.

Q.: What effect had the different solutions on the shells of the eggs?

Mr. Graham: Practically none. Water-glass eggs, when polished up, can hardly be told from fresh eggs. All pickled eggs will crack when placed in hot water. The

object of the pickle is to fill up the pores of the egg shell, to prevent the ingress or egress of air. The moment the egg is placed in hot water the air in the interior of the egg expands, and the shell cracks to allow the air to escape.

Q.: Do you think the chemical purity of the water-glass has anything to do with the precipitation of the sodium solution?

Mr. Graham: Very little precipitate will form if the eggs are put down in August. I think pure lime-water is as good a pickle as any if carefully handled.

Q.: Can you take eggs out of the lime-water as you require them?

Mr. Graham: I do not think there is any objection to that, if you had the crock sealed tight and did not open it till winter time. The objection to water-glass is the cost, and the precipitate which forms on the eggs. If we were able to get English water-glass from the soap factory, I should prefer that so far as my experience goes. None of those who have used water-glass have ever reported it to fail. This year several egg dealers in the United States have tried it, and all have reported it successful. It is somewhat cheaper there. being about 45 cents per gallon there, as against $1.25 here.

Q.: Will pure spring water, without boiling, keep eggs?

Mr. Graham: You would have to use pure water in any case, and if it is pure you would not need to boil it.

A Member: The objection to using spring water would be that it contains a large amount of air, much more than rain water. If the water is boiled the air is expelled.

Mr. Graham: It is much safer to use boiled water. I may say that the egg dealers throughout the country use lime entirely. The secret of their success is not the pickle, but in the preparation used for cleaning the eggs after they are taken out. They have a secret preparation for this which gives the egg the appearance of having been preserved in glycerine. Eggs with this appearance are favored on the English market.

Q.: If the solution gets too thick, what do you do?

Mr. Graham: Add a little more water to it.

Q.: Will bad eggs sink?

Mr. Graham: No; mix your pickle first and then put your eggs in, and the bad eggs will not sink.

Q.: Can the water-glass solution be used twice?

Mr. Graham: No; once only. The eggs for College use are put down in an ordinary syrup barrel, and water is added to the solution from time to time to make up for the loss from evaporation.

THE SUGAR BEET INDUSTRY.

Dr. H. W. Wiley, Chief of the Bureau of Chemistry, U.S. Department of Agriculture, Washington, D.C.

I sometimes say that if you will tell me three things about a nation I will tell you what position that nation occupies in the scale of civilization. The first question is, how much sugar does a nation use? second, how much soap does it use? and, third, how does it treat its women? If it uses a lot of sugar and soap, and has the highest possible regard for its women, that nation occupies the very front rank in civilization.

Sugar Crop of the World. The sugar crop of the world is enormous. Less than a hundred years ago sugar was regarded as a luxury; was thought to have no food value, and was reserved only for the rich. What a change has taken place! It is no longer a luxury, no longer a condiment, but a food for the poorest. The world's sugar crop of the present year is about 10,636,700 tons, and of that amount 6,741,700 tons are the product of the beet. Less than four million tons were produced from the sugar cane, the palm, the maple tree, and the sorghum plant and all other sources of sugar.

Effect of Environment on the Beet. Until 150 years ago the beet was a poor struggling plant, indigenous to the shores of the Mediterranean, and regarded simply as a useful table vegetable. Two thousand years ago it only grew wild on the shores of that inland sea. It was then an annual plant. Nothing exhibits more strikingly the influence of the environment of a plant than the history of the beet. Transplanted to a northern climate, it did not find time to ripen in a year, but instead of being discourag, it adapted itself to the climate and gradually became a biennial plant. That was the first great change it underwent. Even yet when grown in southern climates, this plant shows a tendency to revert to its original habits. The sugar was placed in the beet for the purpose of maturing the seed. The longer you can put off the production of the seed the longer you can store this reserve and preserve it for the use of man. The first year of the growth of the beet is, therefore, for the purpose of securing this store of material, and the second year for the production of seed. Every grain of sugar obtained from the beet is the result of science applied to agriculture. There could have been no sugar industry as the result of accident ; it is the product of scientific study applied in a practical way to make the beet a sugar-producing plant. By this means the native beet, containing from three to five per cent. of sugar, has been developed until it will produce 15 or 16 per cent. This wonderful change has been brought about by the application of scientific agriculture.

Consumption of Sugar by Different Nations. I have mentioned the chief sources of sugar in the world—most of them important. The question often occurs, Where is the sugar eaten that is produced ? We find that the English-speaking people are the greatest sugar eaters, the largest consumption being in Great Britain, where it amounts to 91.6 pounds per head annually. In this Dominion of Canada it is perhaps quite as great, but I do not have the statistics at hand. I have not the figures, but they are high. The United States comes second with 66.6 pounds per head. Then we find a great drop to the German nation, with a consumption of 33.9 pounds per head. The French eat a little more, i.e., 36.9 pounds. The consumption of the other nations is shown in the accompanying table :

Consumption of Sugar Per Capita in Europe and the United States.

	Inhabitants. 1900.	Consumption per capita. 1900-1901.
England	40,708,000	91.6
United States	74,627,907	66.2
Switzerland	3,145,000	60.3
Denmark	2,364,000	54.8
Sweden and Norway	7,175,000	38 2
France	38,565,000	36.9
Germany	55,835,000	33.9
Holland	5,075,000	32.4
Belgium	6,670,000	23.3
Austria	43,345,000	17.6
Portugal and Madeira	5,110,000	14.7
Russia	107,000,000	14.0
Spain	18,200,000	10.6
Turkey	24,515,000	8.0
Roumania	5,612,000	7.8
Bulgaria	3,316,000	7.7
Greece	2,465,000	7.2
Italy	31,856,000	6.1
Servia	2,413,000	5.2

Without going into the soap question, you will see that from the standard of sugar consumption what I said at the beginning of my remarks is approximately true.

I believe this industry is just beginning in the Province of Ontario. Therefore some of the more practical points in connection with the agriculture of the sugar beet will interest you most.

First, let me say that I have no interest in any land on which beets are grown, nor in any factory or firm making machinery for the culture or manufacture of sugar beets. I am simply interested in this as one of the most important agricultural industries in the world. I will say that while our scientific men engaged in agriculture study very carefully the principles of pig, cattle and sheep feeding, we pay very little attention to the principles of man feeding. Who ever heard such a lecture at a Farmers' Institute ? and yet, in my opinion, man is just as important an animal as the

pig, and perhaps deserves as much consideration. Yet the strangest thing is that the only men who are fed scientifically are prize fighters and football players. These men are put on a scientific diet, but outside of these two classes I do not know of any instance. Who ever heard of a minister of the Gospel being fed specially for the purpose of his profession, or a lawyer or a farmer ? And yet there is just as much to be secured in the scientific feeding of men who are training for special purposes as there is in the scientific feeding of pigs for bacon or other purposes. When more attention is given to the scientific feeding of man the great function that sugar bears as a human food will receive due consideration. We now eat sugar mostly because of its sweet taste and not for its nutritive properties.

The Influence of Latitude on the Beet. The sugar beet does best when grown as far north as it can be grown. It develops its highest sugar contents at a high northern altitude. This is due to the fact that sugar making is a function of sunlight and the more of it you get the more sugar will be produced. Sugar is formed in the green cells of the leaf under the influence of light. Therefore, if you can push this plant up north, you get a longer day and more sunshine, and consequently more sugar. This is one reason. The second reason is that a high temperature injures the beet in some way and interferes with the formation of the sugar, and promotes the formation of cellulose, which is a substance very closely related to sugar. The further south you go the higher temperature you get and the less sunshine during the growing season, and the result is a lower percentage of sugar. The experience in Europe is that the richest beets are those grown farthest north. The only northern limit to the growth of the sugar beets is fixed by the inability to mature the crop. The sugar beet is not injured by light frosts. It takes a killing frost to do it harm, so that it can be grown later into the autumn than almost any other crop. In our own country our best beets are grown near our northern limits, or near the Canadian frontier—in Northern Indiana, Wisconsin, Michigan and New York. On the Pacific coast the climate is modified by the ocean. There we have cloudless skies and a mild climate moderated by the Pacific breezes. Therefore, California and our other Pacific States have shown their ability to produce beets of a high character. There the beet can work all day and very day throughout the growing season. In the central and eastern portions of our country the industry has pushed itself up to our northern frontier. Throughout Ontario you have practically the same conditions as we have in Michigan, and that State is one of the best we have for the growth of beets.

Suitable Soil. As regards the soil I take the position that while the soil is one of the elements of environment, in my opinion, it is one of the least important elements. The scientific farmer will build up a suitable soil if he does not find one ready to his hand. Hence, all kinds of soil can be made to produce crops. In the southern part of the United States you will find crops growing on what appears to be pure sand. These crops have to be fed, to be sure. We have had to give up many of the ideas in regard to beet growing which we have obtained from our European brothers. It was formerly supposed in Europe that nothing but a rich loam would produce beets. I have seen in Northern Indiana beets growing in almost pure sand, and in the State of New York I saw a magnificent crop growing on what was once a swamp, where the soil was largely of a vegetable nature. There could be no greater contrast than this. There is one kind of soil, however, on which beets wil not grow well for mechanical reasons, and that is on land that has an impenetrable subsoil. The tap root of the beet must go straight down. If it meets any obstacle it will form two or three tap roots, and be damaged for sugar making. There is also a certain kind of soil that is best adapted to the beet. It is a soil with enough sand in it to make it porous, and enough clay and humus to make what we call a loam. You need not despair of any kind of soil provided you get a good seed bed. But you cannot grow beets without subsoiling. Surface plowing, such as one of the speakers described this morning, is all right for grain crops, which are surface feeders. For beets, however, there should

be at least sixteen inches of loose soil. We do not want the subsoil thrown on top, but we want a place for the tap root of the beet. Therefore, the seed bed should be prepared by good plowing and deep subsoiling, so that the downward growth of the tap root of the beet will not be deflected.

Best Time for Plowing. As to the time for plowing, it is hardly worth while for me to go into that point. The chief thing to remember is that if you have a plowed field lying idle in warm wet weather all the soluble plant food is likely to be washed out. An early fall plowing with some catch crop to save plant food and which can be turned under in the spring, is desirable for the south, but in this country the frozen soil will prevent the leeching effects of rain, and you will have more time in the autumn than in the spring to do the work. Fall plowing is, therefore, to be recommended.

Seed Production. Good and fertile seeds are of the utmost importance. Beets of good shape and high grade are selected for seed production and preserved in silos. The method of seed production includes, first, the determination of sugar in the mother beets by polarization. This is not done until the spring, just before planting time. If you analysed the beets when first taken up they would all be rich in sugar, but on keeping some of them tend to degenerate, and these must be discarded. In the spring those are selected that have degenerated least. The seed we use is for the most part produced in Europe. I am firmly of the opinion that seed should be grown in the country where it is to be used, for the reason that the plant will then become acclimated. In experiments made in Nebraska we found that seed produced there yielded beets containing almost half a ton more sugar to the acre than seed of the same quality imported and planted side by side under the same conditions. Part of this inferiority is due to the deterioration which the seed undergoes in transit, but most of it is due to the fact that the native seed is better adapted to its environment. Beet seed in Europe is produced at central farms under scientific control. The beet is like a pedigreed animal. You know the tendency of high-bred animals to fall away from their high character; they can only be kept up by continued careful breeding and selection. It is the same with the beet. In the United States very little has been done commercially in the production of seed. Some seed is being grown in our country and doing very well, but there are no large seed farms such as we find in Europe. If the industry is to succeed to the fullest extent in this Province my impression is that you will have to have at least one great central farm where the seed can be produced. This will be cheaper than importing it, and you will have better seed for your purposes.

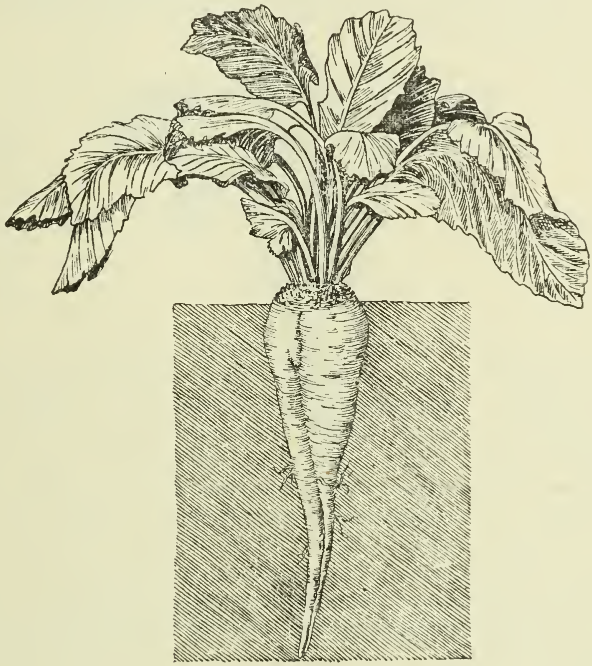
Planting. The seed should be planted close together—20 or 25 pounds to the acre. The retail price of seed is ten cents per pound or more, and, therefore, it is of some financial importance that it should be produced at home. The surface of the soil should be in the best possible tilth. The beets should be planted in rows eighteen inches apart, unless the soil is very fertile, when they may be closer. If the soil is very infertile the distance should be increased. The more seed you plant to the acre the better. What we call a beet seed is really a cluster of seeds. Sometimes there will be four, five, or six sprouts from the same seed. When the seeds grow they will grow in clumps, but they are not good germinators as a rule. Theoretically, one hundred balls should produce three or four hundred sprouts, but in practice one hundred and eighty sprouts are considered a good average. This is the reason we have to plant the seed in such quantities.

Thinning. As the beets grow they must be thinned. This cannot be done by machinery, as sometimes three or four are growing from the same seed. The person doing the thinning must select the young plant which promises best. This is held firmly by the thumb and finger and the others are removed, disturbing the selected plant as little as possible. One plant should be left every eight or nine inches, so as not to raise a big beet. The ideal size of a beet is about twenty ounces. If the soil is very fertile, unless the beets are crowded together, they will often grow too large.

Cultivation. The cultivation of the sugar beet is a simple matter. It is surface cultivation as described by Mr. Raynor in his address this afternoon. Shallow cultivating is done after the beet is planted, the deep plowing having been done beforehand. The object is to keep the surface in good tilth and to keep down the weeds. Special care must be taken when the beets are young not to cover them up. The young beet is very tender, and the least little twist given to it in cultivating will result in deformity. It must be started right. As soon as the beets have grown so that the leaves cover the surface of the soil cultivation ceases and they take care of themselves.

The attempt should always be made to grow the beet with as little of the top out of the ground as possible. The top above the ground is called the "neck," and this is always cut away before the beet enters the factory.

There is no machine yet invented that will successfully harvest the beet and cut the neck off. If it could be done it would mean a great saving of hand labor. The reason for cutting off the neck is that this portion contains much more mineral salts than the rest of the beet, and these salts interfere with the crystallization of the sugar. It is more economical, therefore, to remove the necks and feed them to cattle, although they contain much sugar.



Correct position of a mature beet in the soil.

Beet Pulps as Cattle Food. After the sugar is extracted from the beets the residue is very valuable for cattle food, being very palatable and nutritious. One hundred pounds of the pulp coming from the diffusive batteries contain 94 pounds of water, and to remove the surplus water a press is used. In many places drying kilns are now used to reduce the moisture to fifteen or twelve per cent. This renders the food much more concentrated, easier to transport and removes all danger of decay.

Cost of Growing Beets. The question is often asked, How much does it cost to grow beets? This is a very hard question to answer. Before answering it I would say that the expectation held up to the American farmers that they could grow beets continuously without feeding the soil is erroneous. A fertile soil will grow several crops

without a fertilizer, but we must feed beets as we feed animals. A farmer should have ten or fifteen tons of beets per acre to secure a good profit. To keep that yield up requires the highest kind of scientific agriculture. I have often said that one of the greatest benefits of the beet industry to the community was the fact that it gave an object lesson in scientific agriculture. Only the men who practise scientific agriculture can succeed. When this is practised in one crop it spreads to other crops. In the north of France the yield of wheat fifty years ago was 17 bushels per acre. To-day on the same fields it is 27 bushels per acre. Why? Simply because they have introduced the growth of the sugar beets and the result is that they have increased the yield of farm crops. The soil, instead of becoming less fertile, becomes more and more fertile and there is no danger of its becoming exhausted. One of the great benefits of the industry, therefore, is that it introduces to the community an object lesson in scientific agronomy, which spreads to every branch of agriculture.

Use of Fertilizers. Fertilizers are not inexpensive commodities, and therefore it requires an outlay of money to produce a good yield of sugar beets. The beet is a greedy eater, and takes more fertilizing materials from the soil than almost any other crop, especially nitrogen and potash. A soil deficient in nitrogen will not grow a good crop of beets. If the soil has not enough nitrogen that substance should be supplied. A crop of beets will take about the following quantities of plant foods per 1,000 pounds of beets from the soil :—

PRINCIPAL CONSTITUENTS OF SUGAR BEETS PER 1,000 POUNDS.

Constituents.	Roots. lbs.	Leaves. lbs.
Potash	3.3	6.5
Phosphoric acid	0.8	1.3
Magnesia	0.5	3.0
Nitrogen	1.6	3.9
Total ash	7.1	18.1

There are various forms in which nitrogen can be supplied. A few years ago it was commonly supposed in Europe that farmyard manure was not suitable. This is found to be erroneous. Experiments have shown that a judicious application of well decomposed farm yard manure increases the yield per acre and the sugar content. Almost any form of organic nitrogen is suitable—dried blood, for instance, or cotton seed meal. In Europe the greatest benefit has been found from the judicious application of nitrate of soda. This salt is very soluble, and no great quantity must be applied at once. It is partly applied at the time of planting or soon after. It is again applied after three or four weeks. The advantage of nitrogen in this form is that it is ready for use by the plant and does not have to go through any preliminary preparation. It is a cooked food, so to speak. The beet specially needs its nourishment at the beginning of its growth. At that time it wants nitrogen, but it does not want a supply that will last till the end of the season, because if the available nitrogen continues present in the soil in large quantities the beet will continue to grow, and not ripen up properly. Other nitrogenous fertilizers are not always ready at the time the beet requires them. Nitrate of soda is the most convenient form because its application may be strictly controlled, and it may be withdrawn at the time the beets should begin to ripen. In this climate the use of fertilizers containing unnitrified nitrogen would tend to supply too much nitrogen near the end of the growing season—especially if the conditions for nitrification during the early period of growth were unfavorable.

In regard to the use of potash and phosphoric acid, the quantity required will depend on the nature of the soil. To produce a crop of beets of fifteen tons to the acre on ordinary soil will require a considerable amount of fertilizing material, in which potash and phosphoric acid will be important constituents. Phosphoric acid can be applied freely without danger of injury.

COST OF PRODUCTION.

Labor, interest on investment, rent of land, fertilizers, and everything together, bring the cost of an acre of beets up to $35 or $40. If you are going to grow good beets you must expect to expend that much on every acre. The profit then depends upon the magnitude of your crop. If you get from 12 to 15 tons per acre you will have a handsome profit at $4 per ton. Beets can be grown advantageously on land that is worth $300 per acre, and pay the interest on the investment, but no man can grow wheat on land worth that much and pay all expenses and the interest on his investment and have much of a profit. The land in Europe is all high priced, and therefore they want a crop of this kind. Beet culture belongs to the intensive and not the extensive form of agriculture.

I am glad to know that you are interested in this great industry. Our own people are very much in earnest about it. We have in the United States about forty large sugar factories. European engineers and chemists are now coming over to us to learn how to make beet sugar because we have gone away ahead of them in mechanics and technique. We have larger factories, more economically worked and producing sugar at a less cost, labor alone excepted. Although our labor is treble their price, we are producing sugar

Klein Wanzlebener Sugar Beet.

at perhaps as low a cost. Our great trouble is on the agricultural side of the business. We have not yet taught our people the principles of agriculture involved in growing the best beets. Our people belong to the extensive agricultural class. Our whole trouble now is to teach the people the proper art of growing beets. I believe every country needs this intensive method of farming. The days of big farming have passed, and the days of intensive farming have come, and the glory of the agriculture of the future will be found, not in large fields poorly cultivated, but in small fields, well cultivated. With us the sugar beet industry has come to stay, for it has an actual necessity behind it. The cane industry has nothing except the sugar itself, and it must be fostered in a climate that is enervating. The beet industry has come not only to stay, but to teach the northern portion of our country the true principles of agronomy by the introduction of the best system of agriculture. I believe that if the people of this Province should undertake the introduction of this industry, and apply these principles of scientific agriculture, in which you are so well versed already, and which has been such a blessing to all parts of this great continent, success will certainly be yours. Failure may come in some instances, as it has in our country, but on the whole, progress has been steady and sure. Because one firm fails is no reason why you should condemn the industry.

Failure, if not crushing, brightens the faculties and makes you more determined in the end to win. I feel it a great compliment to me and to my country that you have asked me to come and give you a little of the experience I have been able to gather in the last fifteen years. I have tried to place before you some of the essential features that must be considered in this great industry, which at once is agricultural, chemical, and technical.

Q. : Kindly explain the conditions of the bonus system in Germany and France.

Dr. Wiley : It is the general impression among our people that the Government pays a direct bonus for the production of sugar. Such is not the case. Now, in France, every person growing a ton of beets is taxed about $4. Then they have a commission which fixes the "legal yield." Suppose this is fixed at 11 per cent. ; that means that every ton of beets is expected to produce 220 pounds of sugar. But suppose it produces 12 per cent., or 240 pounds, you will see that, if the sugar is exported, they get a rebate not only on the 220 pounds, but the same rate of rebate for the extra 20 pounds—at the rate of $4 for the whole. The European bounty is not paid to the producer, but is paid from the tax collected from the producer and consumer to the sugar which is exported from the country. There is to be a meeting in Brussels this month to consider again the question of sugar bounties, and to try and devise some means whereby this bounty system can be suppressed. If England would join the United States in a countervailing duty against bounty fed sugar, the bounties would not last a month. For twenty-five years England has been eating sugar and Germany and France have been paying the bills, and on that account England can hardly be expected to join in the protest against bounty fed sugar. The English colonial sugar industry has been ruined on this account. They cannot afford to lay down sugar in London at this ruinous price. If the bounty fed sugar were shut out, the colonies would then be able to compete again. The bounty is simply an excess of rebate because the actual yield is greater than the legal yield, which is fixed by the commission. The "Kartill" is an agreement between the sugar producers and refiners in Germany and Austria by which a certain minimum price is guaranteed the producer, while the consumer is charged a higher price, and the profit divided between the parties to the compact.

Q. : How much does the farmer get for his sugar beets in France and Germany ?

Dr. Wiley : About $4 or $4.50. The price is often fictitious in the co-operative factories owned by the beet growers. And they pay an internal revenue of $4, so that it costs the manufacturer about $8.

Q. : Do they use artificial fertilizers in Michigan ?

Dr. Wiley : Unfortunately, no, at least not generally ; consequently the crop is only about eight or nine tons per acre instead of twelve or fifteen.

Q. : What percentage of nitrogen and phosphoric acid, etc., does the crop take from the land ?

Dr. Wiley : Ten tons of beets as brought to the factory will contain about 20 pounds of phosphoric acid, 60 pounds of potash, and 32 pounds of nitrogen. The fertilizing ingredients are retained mostly in the necks and the leaves. The potash may be nearly all recovered in the molasses. (For detailed information consult table above.)

Q. : If the tops, etc., are retained on the land, the greater part of these substances is returned to it. is it not ?

Dr. Wiley : Yes, the greater part is then returned to the land.

Q. : How much lime is required in the manufacture of beet sugar ?

Dr. Wiley : For every 100 pounds of juice it is necessary to use about 3 pounds of lime. This will give about 10 pounds of sugar. Carbonic acid is used in the purification of the juice, and it is obtained from the lime kiln. All factories have two or more kilns for this double purpose, i.e., to supply lime and carbonic acid. The lime is mixed with a little of the juice, forming "cream of lime." This cream of lime is used in the process of purification. Carbonate of lime is formed by mixing the carbonic acid and lime. The beet juice, when it comes from the diffuser, is brown or black in color, but

after its treatment with the lime and carbonic acid it becomes a beautiful amber color. Sometimes the process is repeated two or three times to get the highest degree of purity.

Q.: For what purpose is "bone black" used in the process of the manufacture of beet sugar?

Dr. Wiley: After the process of purification and filtration is completed, the bleaching of the juice is usually effected by the injection of sulphur fumes. In spite of all the care you can use, the juice is more or less amber colored when it comes from the filter. To render it absolutely white, sulphur fumes or bone black is used. The greatest decolorizer is animal black, or animal charcoal, or "bone black," as it is commonly called. Bone black is worth about $80 per ton. After it has been used it is not thrown away, but is revivified. Bone black is used principally in the larger refineries. After the juice is purified and decolorized and reduced to a syrup, it has to be evaporated in a vacuum, where it reaches the boiling point at a very low temperature. The syrup is then converted into a dense mass in a very high vacuum. It has then reached the crystallizing point, and crystallization is induced by a sudden chilling process, secured by adding some cold or cool syrup to the mass. The sugar crystals are built up in the pan, and must all be of nearly the same size, and much care and experience are necessary in this department of the work. The crystalline sugar is then put through the mixer to break up the large masses, after which it goes through the centrifugal machine, which extracts the molasses. In four or five minutes after the sugar drops from the vacuum pan, I have seen white sugar in the barrels, so rapid is the process of passing through the centrifugal machine.

Q.: Is there any danger of lime being left in the sugar?

Dr. Wiley: Not in refined sugar; it is separated by crystallization.

Q.: What kind of lime stone is necessary?

Dr. Wiley: Any good lime-stone that does not contain too much magnesia. Two or three per cent. would be too much, I think.

Q.: Our lime-stone at Guelph is a magnesian lime-stone, and we should like to know whether it is suitable for the purpose.

Dr. Wiley: I cannot say what is the limit of magnesia that suitable lime-stone may contain. I know they prefer lime-stone with as little magnesia as possible.

Mr. Fowler: It should contain not more than one per cent.

Dr. Mills: I believe they are using in some of the Michigan factories, lime-stone containing a considerably higher percentage of magnesia than has been stated here to-night. A great deal of lime-stone has been coming to us for analysis from different parts of the Province, and we want to reach a reliable conclusion as to how much magnesia it may contain. On this point, the doctors seem to differ.

Prof. Harcourt: I have been endeavoring to gather some information on this subject. Dr. Wiley will remember that I wrote to him some ten days ago about it. When in Michigan a short time ago I learned from the chemist of the Saginaw factory that they were using lime-stone that contained as high as seven per cent. of magnesia. But the amount of magnesia would depend upon the amount of acid they allowed in the juice. When the juice is slightly acid, more magnesia may be present. In other factories, they were using from 2 to 5 per cent.

Dr. Shuttleworth: The Guelph lime-stone is really dolomite, and contains from 13 to 15 per cent. of oxide of magnesia.

Dr. Mills: Then it is not suitable?

Dr. Shuttleworth: I wrote to the chemist of the Caro factory on the subject, sending him the analysis. He said he was conducting experiments to ascertain exactly how much magnesium oxide the lime-stone might contain. He said that he feared the amount in the Guelph lime-stone would entirely unfit it for use in a sugar factory. He said he thought from his unfinished experiments that not more than 3 per cent. should be permitted. He referred to carbonate of magnesia, which would be heavier than oxide, so that lime-stone that contained three or four per cent. of carbonate would contain something between one and two per cent. of oxide.

Dr. Mills : Where have we a satisfactory lime-stone deposit ?

Dr. Shuttleworth : North of Newmarket ; in the neighborhood of Beeton, and also I believe in the vicinity of Orillia and Peterborough. We have not analysed the Dunnville limestone here, but I believe it contains less magnesium oxide than the Guelph limestone. As long as the limestone can be laid down at the factory for $1.50 per ton, I think it can be used all right, and therefore we can afford to transport it 150 miles, provided we have everything else right..

Dr. Mills : In the factories I saw in Michigan it came about 100 miles, and cost about $1 per ton.

Dr. Shuttleworth : At Caro it costs $1.50 per ton by the time it reaches the factory.

Q. : Is a good supply of water necessary ?

Dr. Wiley : Each factory will use immense quantities of water per day. The water must be cold, as it is used for cooling the vapors from the vacuum pans. Water is also necessary for washing the beets, and for that purpose it is used in large quantities. It is customary to carry the beets from the storehouse to the factory by means of a sluice of water, first, because it is cheaper, and, second, because the washing is assisted by the rolling and tumbling of the beets in the water. In locating a factory, after the question of transportation is considered, which ranks first in importance, the next question is that of water supply.

Q. : Have you been able to produce as good seed in the United States as has been produced in Germany ?

Dr. Wiley : We have been able to produce better seed. I think it is highly important that the seed should be produced in the country where it is to be used.

Q. : Is it possible to extract all the sugar the beets contain ?

Dr. Wiley : By modern methods, practically all the sugar contained in the beets is extracted. Usually only from .35 to .60 per cent. of sugar is left in the pulp.

Q. : Is most of the pulp dried in Germany ?

Dr. Wiley : No; most of it is put into the silo after being pressed, and herds of cattle are kept to consume it. I saw pulp perfectly good after it had been kept for three years in this way.

Dr. Shuttleworth : I should like to ask Dr. Wiley if he thinks we can have the same success here, if our factories are properly managed, as they have in Michigan ?

Dr. Wiley : I do not think I can give an opinion, as I have hardly seen enough of the country. But I will say that the further north you can mature the sugar beet, the better beet you can grow. I will say this much. If you can beat us as much at raising beets as you can at raising cattle, we shall have to go out of the business. Growing beets requires just as much care and attention as raising cattle.

OUR DAIRY INTERESTS—WITH HINTS AND SUGGESTIONS FOR NEEDED IMPROVEMENTS.

By J. A. Ruddick, Chief of Dairy Division, Ottawa.

I feel that it is no small honor to be invited to address such a progressive body of men as the officers and members of the Ontario Agricultural and Experimental Union. Although this is the first time that I have had the privilege of attending your annual meeting, I assure you that the transactions of the Union have not been without interest for me in the past, and now that I have come into personal touch with the workers, that interest will be very much increased in future.

As you have already been informed, I am to speak to you to-day upon some matters relating to the dairy industry, and the topic which has been assigned to me is broad enough to admit of considerable wandering. I shall try to keep in mind, however, that this is not a special dairy meeting, and that probably many of you are not actively engaged in dairy work, and only interested in the subject, like every Canadian should be,

because the industry, and its maintenance upon a sound and prosperous footing, is of vital importance to the country at large.

A brief review of the past season's operations may not be out of place. Prices for cheese have ruled somewhat lower than during 1900, the striking feature of the market being the comparatively low prices obtained for the autumn makes. Although the wind-up has been rather disappointing to all sections of the trade, the situation offers some encouragement for the future, because the low price should, according to all precedents, create a very strong consumptive demand between now and the opening of the season of 1902. Then there is the remarkable shortage in the supply from all sources. The latest available figures show that the decrease in the total shipments from Canada and the United States since the first of May, 1901, amounts to 445,291 boxes. Recent advices from New Zealand state that the tumble in prices, coming as it did just at the opening of their cheesemaking season, caused the combined factories to contract for butter in-instead of for cheese, and that the weather has been unfavorable for the production of milk. The probabilities are the shortage from New Zealand up to April 1st will amount to something like 70,000 boxes. The make of cheese in the United Kingdom during the past season was also below what it has been, so that on the whole there is an enormous decrease in the supply of cheese up to the opening of next season's operations. Of course the amount in store is an unknown quantity, but it cannot be very greatly in excess of what there was at this time last year. If stocks are not reduced to a low point before the new season's cheese is offered it will be a very striking proof of the statement, frequently heard of late, that the consumption of cheese is rapidly falling off.

We have heard a good deal also about the deterioration in the quality of Canadian cheese. A gradually declining market may have had something to do with it during the past season, but it is no new thing, and the complaints which have come from our customers in England, for two or three years past, are too serious to be ignored.

It would be a difficult thing to prove that the quality of our cheese has actually deteriorated, but I do know that a large quantity of very inferior cheese has gone forward during the past two seasons. I speak with some assurance on this point, because during that period I have had exceptional opportunities for getting the information by constantly visiting the Montreal warehouses, and examining large numbers of cheese. There is no other way by which this information could be got so accurately. Whether there is more poor cheese now than there was three years or four years ago I am not prepared to say, but it does seem as though we have not made the advancement for some time past that one would naturally expect to follow the excellent work of the dairy schools and travelling instructors, to say nothing of the great prominence given to dairy matters by all sections of the press, but particularly by the papers devoted exclusively to agricultural matters.

It seems to be in order, then, that we should direct our attention to this matter, and endeavor to find out the cause of this retrogression, or at least stagnation, in our cheese industry.

Having said so much concerning the industry at large, I wish now to confine myself particularly to Ontario. What, then, are the reasons why Ontario to-day is not as progressive along the lines of cheesemaking as she has been in the past?

It seems to me that one of the things which has been retarding progress with us is the self-satisfied feeling which has been all too common for several years past. We have been patting ourselves on the back and depending on past achievements rather than on future exertions ; we have been justly proud of the fact that Ontario was among the very first countries to employ travelling cheese instructors, and that many of our boys are now filling important positions as instructors in different parts of the world, but these facts in themselves do not improve our cheese. It would have been more to the point to have kept these instructors in Canada, instead of allowing them to leave for the purpose of assisting our competitors to win against us. Every Canadian was proud of the splendid victory which our cheesemakers won at Chicago in 1893, and the advertisement which Canadian cheese received on that occasion was worth a great deal, but to hold the position attained called for redoubled efforts and increased vigilance all

along the line. Having earned such a high reputation, more was naturally expected of us. The very beating which we gave our competitors has ever since been an incentive to them for employing every possible means to overtake us, and if we are to judge by recent events their efforts in this direction have not been without effect. I do not think Canadian cheesemakers are apt to have their heads swelled very much by the results of the competitions which have taken place during the past summer at Buffalo, with our friends in New York State claiming the victory for October, unless it may be from the ridiculously high scoring of the cheese.

But there are other and more concrete causes which are working against the advancement of the cheese industry at the present time. I believe the most serious one is the existence of so many small factories, a condition which brings in its train a whole string of evils.

In the first place, the competition for milk is so keen that the cheesemaker is often prevented from exercising his judgment in rejecting any which is not in proper condition, and the patrons realizing that if one factory does not take their milk another will, become indifferent and careless in their methods of handling it. The price for manufacturing is cut down to the lowest possible limit, which means poor buildings, poorly equipped in every respect. Given these conditions, along with the inferior milk, it goes without saying that the most skilful cheesemakers cannot turn out an article that will meet the present day demands of the market.

The Canadian cheesemakers, as a body, are the best trained of any in the world to-day, and if they were given half a chance there would be very little cause to complain of the quality of our cheese, but any calling in which the wages are sometimes screwed down as low as thirty, and even twenty-five dollars a month, and that for only about half the year, is sure to number within its ranks men who are not of the right class to make any industry a success.

Many bright young men take up cheesemaking, and fit themselves thoroughly, only to find when they want a situation that the man who will work the cheapest is usually given the preference, regardless of his qualifications. The result is that scores of the most likely makers quit the business in disgust and take up some other work. Of course there are many notable exceptions of men who have made cheese-making in Ontario a life's work, and who have succeeded in making a name for themselves and for the factories which they have managed, but it has not been done in a factory belonging to the class which I have described. I do not wish to be misunderstood. I know that there are hundreds of first-class cheesemakers in Ontario, and I know also that there are hundreds of good factories where the conditions which I have outlined do not prevail. If it were not so the cheesemaking industry could never have succeeded as it has. But I am trying to deal with the defects in the business. Therefore, I desire to show up its weak spots in the strongest possible light. Nor is it to be supposed that all cheese which is made in small factories is of inferior quality, for there is nothing to prevent the very finest cheese from being turned out of a factory which does not make more than five or six cheese a day, providing the conditions are what they should be. The point I want to make is that such a small business means cheapness, and although a good factory may be put up to start with, lack of funds will prevent it from being kept up to the mark, the necessity for increasing the milk supply encourages the patronage in sending milk which is not in good condition, and if by any chance a capable maker is secured he is not likely to remain long in a place which has so little to give him in return for an intelligent, skilful service. I know as well as any person that good cheese is often found in very small factories, but the general tendency is demoralizing, and can only have one result in the end.

Then there is the comparative cost of manufacturing in small factories as compared with larger ones. The actual cost at many factories is over one cent per pound, not counting the cost of hauling the milk, and this, notwithstanding the fact that everything is done in the cheapest possible manner, and starvation wages paid to the cheesemaker. At other and larger factories where everything is first-class, and managed by a well-paid cheesemaker, the cost of manufacturing, including the hauling of the milk, has

been reduced to less than one cent per pound of cheese. The money lost to the dairymen of Canada through this source amounts to an enormous sum annually.

Turning our attention to the buttermaking branch of the industry, we find some features of it in a somewhat different position from the cheese branch. Our exports for the past season show an increase of something like 154,000 packages over 1900, approaching very nearly in volume, and exceeding in value, the record export of 1899. Prices during the past season have been well maintained. The most gratifying feature of our butter trade is that the quality of our butter continues to improve and give better satisfaction to the consumers. Much of the improvement is due to better transportation facilities, which enables us to place our butter on the English market with less deterioration in transit than there was formerly. The refrigerator car system, with routes subsidized by the Dominion Government, reaching nearly every part of the country, the cold storage warehouses and refrigerated space on the steamships, have made a successful export trade in butter not only possible, but capable of almost indefinite expansion. If we continue to improve as we have done for some years past it is quite possible that our exports of butter will grow to a very large extent. But we shall not win a foremost place on the markets of Great Britain with our butter as easily as we did with our cheese, because the competition is much keener. We have Denmark, Australia and New Zealand to deal with in this competition, and these are countries where no effort or expense is spared to produce the very best article. No danger of them doing anything like our American cousins did with their cheese trade, when they attempted to compete with us, and at the same time flooded the market with skimmed and filled cheese. Their experience has ever since been an object lesson which has not been lost sight of by the rest of the dairy world. But we have much to do, and must become more thorough in our methods before Canadian butter occupies the position it should have on the Old Country market. The only hope for the future is to make a superior article, and then see that it is transported to the customer under such conditions as will ensure its arrival without deterioration. The market is now more than ever supplied wtih under-grade butter since Russia has entered the field. Let Russia supply that second class article, for that is not good enough for the product of Canadian intelligence and skill properly applied.

It is a good thing for our butter business that those engaged in it have not been given to self-laudation so much as the cheesemakers have, but realizing their deficiencies, they have, with the help of the dairy schools, made an earnest effort to improve.

Now it is one thing to criticize and point out defects, but it is another and generally more difficult thing to show how these defects may be remedied. It is very easy for me to say we must have larger and better equipped cheese factories and creameries. I only wish it was as easy for me to point out to you how this desirable state of affairs is to be brought about.

It is obvious that if large factories are to take the place of the smaller ones, that the patron must be convinced that it will pay him to send his milk to the larger one. He will never do so for the sake of the industry as a whole. Something might be done by giving prominence to annual statements of large and flourishing factories. The lower cost of manufacturing would appeal to the average patron as no other argument would.

I would have more edge put on the work of the travelling instructors. These men have done excellent work, and I have no fault to find with them, but they have been hampered a good deal by not being entirely independent of the factories. This applies perhaps more particularly to Eastern Ontario than it does to the Western part of the Province. The instructors should give more attention to the milk supply, and to the general condition of the factory, and then be in a position to state the bare facts to those concerned without prejudice to their own interests. I am afraid there has been too much tendency to gloss things over for the sake of peace and popularity. If the true state of affairs were better understood by patrons they would not be so ready to support the poor factories where such indifferent work is done.

It would be a good thing if some means could be devised for compelling the proprietors of many cheese factories and creameries to improve the sanitary condition of their premises. The remarks which one hears concerning the offensive character of the

surroundings of the average factory are often so pointed as to make a man feel almost ashamed of being connected with such an industry. We might very well follow Denmark's example in this respect, where they have a law which lays upon every cheese factory or creamery the obligation to provide proper drainage. It is specified that all waste and slops must be conveyed in a closed tile drain to a certain distance from the factory. With the floors of cement concrete or stone flags there is then no danger of a nuisance being created or the water supply being contaminated, as is too often the case in this country. If the general appearance of the factories and their surroundings were improved it would not only raise the general tone of the business, but it would be bound to have an influence on the patrons by encouraging them to do their part better. Cheese and butter makers are a good deal to blame in this matter, for I have seen many places where the makers were so untidy in their work and personal appearance that for them to complain of tainted or unclean milk would be an absurdity, if not an impertinence, and not very likely to have much effect in any case.

I could relate many specific cases where the product of a factory has been contaminated through the unwholesome conditions arising from defective floors and lack of drainage. As a matter of fact, there can be no effective drainage where the floors and gutters are not absolutely water-tight. I hope to see the day when Canadian cheese factories and creameries will all have cement concrete floors. They are not so nice to work on as a good wooden floor, but if properly put down the cement floor will last as long as the building, and from a sanitary point of view there is no comparison. Better floors is one of the conspicuous needs of the Canadian dairy factories.

There are three prominent defects in Canadian cheese as landed in Great Britain, viz., "heated flavor," "weak open body," and poor condition of boxes.

We have plenty of evidence of late to prove that the natural temperature of the curing-rooms is too high during the summer months to secure good results. Cheese go off flavor and the body becomes rough and mealy, whereas if these same cheese were cured at a lower temperature they would be preserved in better condition and suffer less loss in weight. At what temperature the cheese should be cured to secure the best results, quality and profit both considered, has not yet been clearly established. Cheese have been taken direct from the press and held at a temperature below the freezing point of water for eighteen months, showing at the end of that time very desirable qualities as regards flavor and body. Prof. Dean and others report experiments in curing at a temperature of 38 to 40 degrees with similar results. This, of course, means cold storage from the time the cheese is taken from the hoops. Earlier experiments, some of which I conducted myself, have shown that even a temperature of 60 to 65 degrees as compared with an uncontrolled temperature, going as high as 90 degrees, produced a cheese free from the very objectionable effects of heating, and, further, that there was a saving in shrinkage which, added to the increased value of the cheese, would in a year or two pay for such improvements in the curing-room as would enable the manager to control the temperature to the extent mentioned. A bulletin entitled "Improvement of Cheese Curing-Rooms," giving detailed information for accomplishing this result, may be obtained by application to the Commissioner of Agriculture, Ottawa.

When cheese have a "weak, open body," the blame may be laid entirely upon the cheesemaker. It is the result of insufficient development of acidity in the curd before salting and putting to press. Lack of judgment and haste to finish the day's work are responsible for this defect in the quality of our cheese. Makers who are not well grounded in the principles underlying their work are not able to readily adjust their manipulations to meet the changed conditions of the milk following a change of weather. But I am reminded again that my audience is not made up of cheesemakers, and therefore I shall go no deeper into the mysteries of cheesemaking.

That much of the Canadian cheese reaches the English markets with the boxes in a disgraceful condition cannot be denied by anyone familiar with the facts. The steamship companies have adopted improved methods for loading and unloading cheese since representations were made to them on the subject by Prof. Robertson, but the fact remains that there is still a very large percentage of boxes arriving in a smashed and

broken condition, detracting very much from the appearance and value of the cheese. The agents of the Department stationed at London, Liverpool, Bristol and Glasgow reported as many as 10, 20, 30 and even 50 per cent. of the boxes in a whole cargo as being landed in a damaged condition.

The main reason for this state of affairs is that the boxes are too flimsy, and not well enough made to stand the handling. Many boxes are made of too light material, and some are not sufficiently nailed. It is said that the price of boxes has been beaten down until the manufacturers cannot afford to make as good a box as they might make if paid a reasonable price. Through lack of management on the part of the cheesemaker or factory owner, many boxes do not fit the cheese properly. It is a common thing to find boxes fully one inch larger in diameter than the cheese which they contain, and it is among these that the largest proportion of breakages occur. There are some cheese which carry to their destination with a very small percentage of broken boxes, notably those from Prince Edward Island and from some of the factories in the Brockville district. It is because the boxes are well made and fit the cheese snugly. The factories in the Ingersoll and Listowel districts also have a reputation for attending well to the matter of boxing their cheese, and they are well repaid for doing so. It is regrettable that all factories cannot avoid mistakes of this kind, for it is a simple thing to get a box which fits the cheese properly without the slightest extra cost. More attention should also be paid to the branding of the boxes and marking of the weights. To mark weights with a pencil is a slovenly and unsatisfactory method, which should not be tolerated in any factory. A stencil for the purpose costs only a few cents.

Now there are many other defects in the quality of our cheese of more or less importance, but it would take too long to go into them all. There are a good many with too much acid, and then we have special taints or flavors, such as "fruity," "rancid," "garlicky," etc., which appear from time to time, like infectious diseases, in the best regulated establishments. To overcome such difficulties as these we need more work of the kind done by Prof. Harrison during the past summer in connection with the appearance of "bitter" flavor.

It is safe to say that the principal defect in the quality of Canadian butter, as in the butter from any other country, is in regard to the matter of flavor. The causes which give rise to this defect are many and not always easily located, but the buttermaker has a great advantage over the cheesemaker, inasmuch as he has it within his power to control the flavor of the butter to a very great extent by the use of good flavored fermentation "starters," and by proper attention to the ripening of the cream. His failure to do this is one reason why the butter is often inferior in flavor. Buttermakers must study this question of ripening cream and the use of "starters." The trouble is that very often the "starter" produces a bad flavor instead of a good one. When the farmer sows his seed he expects to reap exactly what he sows. If he sows wheat he reaps a crop of wheat, but if the grain he uses is full of mustard seed I need not point out what the result will be. It is not possible to get fine flavored butter where bad starters are used any more than it is to get a crop of wheat from the mustard seed. The difficulty is that many buttermakers apparently do not know the difference between what is a proper starter and what is not. This is where the necessity for study comes in. Another great need is for a better understanding of the principles underlying refrigeration and cold storage. Creamery managers do not appreciate the importance of keeping butter at the lowest possible temperature. If a creamery cold storage cannot be kept at a temperature as low as 36 degrees by the use of ice and salt in cylinders there is something wrong either in the construction or in the management of it. I have a thermograph record from one of the North West Creameries which varies only between 38 and 34 degrees for a period of one week during very hot weather. The refrigerator never should be used for retail butter or for holding between workings. That means opening the door too often, allowing warm, moisture-laden air to get in, causing dampness and higher temperatures. An ante-room should always be provided where butter may be chilled or held for short periods. Butter is often damaged between the creamery and the refrigerator car by being carried in the hot sun without protection. I have seen it left

for hours on a station platform exposed to the same injurious influence. That is one reason why butter is sometimes delivered from the refrigerator cars in a soft condition. These cars are only intended to hold butter in the condition it is in when delivered to them.

Referring again to protection for butter when being carried in the hot sun. I would point out that a tarpaulin made impervious by means of linseed oil should never be used. The oil seems to absorb heat, and anything lying immediately under such a covering with the sun shining upon it will be at least ten degrees hotter than if exposed to the direct rays. A canvas cloth without any oil is all that is necessary, and it will be more effective if held a few inches above the top of the load in order to allow the air to circulate freely underneath.

The agents of the Department have reported some cases of mould on Canadian butter during the past season. This may be caused by unseasoned timber in the boxes, but it more often is the result of the boxes or parchment paper being infected with mould at the creamery. A great deal of carelessness is displayed in these matters, and if you go into some creameries you will find the parchment paper lying about without any protection when it ought to be handled as carefully as the butter itself. As a preventive measure the paper should be soaked for 24 hours before using, in a strong brine made with boiled water and to which formalin is added at the rate of one ounce of formalin to three gallons of brine. We have never been troubled with mould in the Government creameries since this practice was adopted.

What has been said about the importance of neatness and care in branding cheese might very properly be repeated regarding butter. Indeed I have no hesitation in saying that Canadian butters lacks very much the attractiveness and finish which characterizes the product of our competitors. Therefore, I urge that more attention be given to these matters which are so important.

Now, Mr. President, I will close. I have spoken plainly but from conviction. Some may say that it is not wise for us to advertise our defects in this way, but I do not see how we are to improve unless we realize the necessity for it.

Prof. H. H. Dean: Mr. Ruddick told us some plain facts, and we should profit by them. In addition to what he has said I would urge that we should have, first, more co-operation. The late President McKinley said, "Co-operation is better than competition." It is competition that is killing the dairy industry to-day. The time is coming when our legislators can safely say that it is not possible for any man to build a cheese factory or a creamery unless he can show a good reason for building it; and then he should not build it unless it is in accordance with the most approved plans.

We must also have cold storage. The time is coming when we must either have central cold storage warehouses at different points or some central cold storage, say at Montreal, where cheese can be stored.

We can never compete in butter with Danish butter unless we pasteurize. These two things are very necessary in connection with the dairy industry in this country.

We must also have better cows. We are not giving enough attention to the man who is keeping the cow. Until our people are impressed with the fact that they must have better cows to feed, cheaper food, and better stables, we shall not have the improvement we ought to have.

There ought also to be a conference every year between the buyers and the salesmen. Let them come to an understanding as to the terms on which butter and cheese shall be sold. Last year the cuts in price on cheese sent to Montreal are said to have amounted to half a million dollars. If there were conferences of buyers and salesmen I think it would do away with this. The leading dairy men ought also to hold conferences and agree on certain lines of work and methods of teaching, before they try to teach the farmers what they should do.

J. Stonehouse: I think all will agree that the people we need to reach are the people who do not attend these meetings. The patrons we have here are the men who take the greatest interest in their business, but it is the small, unprogressive factories

that are the menace to our dairy industry, and it is the small wage paid to the makers that is one of the drawbacks to our business. I also realize that the patrons who keep down the wages are the kind of men who will not furnish the best quality of milk. If we are going to make any great progress it must be in dealing with the patrons rather than in instructing the makers. Our makers have dairy schools to go to and they are fairly well equipped, but our future improvement has got to come largely through dealing with the patrons. We should have instructors with more authority to go to the homes of the patrons, see to the sanitary surroundings and the way the milk is kept, and also look after the sanitary conditions of the factories. There has been a good deal of legislation as to cheese, and it has been in the public interest. Why should we not have more legislation in regard to butter ? It would be a good thing if the name of the factory were printed on the box and also the date. A good deal of our butter is kept too long in cold storage before it gets to the old country market. It should be placed on the market as quickly as possible in order to be first grade.

Hon. Sidney Fisher : I came here this morning to take advantage of the meeting of your Experimental Union and try to learn from your experience. I have been much interested in what I have heard, more particularly perhaps in the dairy discussion, because that is the branch in which I am personally interested. I have also had charge of a certain part of this work as Minister. Through the head of that branch of my Department we have been working as best we could in the interest of the commerce of our dairy products as well as in the interest of production. So far as the manufacture and production is concerned Mr. Ruddick has given us a sketch of the present condition of affairs. I venture to say that what he has told this audience is true in fact, and we trust that his statement of these facts going abroad through the country will lead to improvement. It is better for us to face our failings and to understand them than try to hide them. We are a strong enough people and are intelligent enough to be able to overcome our difficulties if we recognize them. If we ignore them and try to hide them from ourselves as well as from our rivals we shall never overcome them.

What Prof. Dean has said with regard to co-operation I believe to be a fundamental truth. The dairy business is a part of farming in which co-operation has begun. It has not yet been carried to perfection by any means. We have diverse interests, and these interests ought to be harmonized.

Cold storage is a means to an end. It is the means by which our products may be carried to the market, but cold storage cannot make bad products good; it can only preserve the products in the condition in which they are when they leave the factory. The foundation of all our dairy progress is proper manufacture. This can only be successfully conducted if the milk, the basis of all, is provided under proper conditions. This comes right home to the farmer and the man who milks the cow, and the man who feeds the cow and takes care of her and of the milk she produces. Here is perhaps the chief failing in our dairy production. I believe more difficulty arises in our factories from bad milk than from anything else. We have a most important work to do in teaching the average farmer to feed his cow and to care for his cow properly, and to handle her milk before it arrives at the factory. This work I think, can best be done through the Farmers' Institutes. You have a splendidly organized system. Through its means, as well as through the Experimental Union, you can reach every nook and corner of the Province, and it is necessary to reach every individual farmer in the country before we can have systematic improvement.

SOIL CULTIVATION.

By T. G. Raynor, B.S.A., Rosehall.

I do not know that I can say anything on the cultivation of the soil that will be really new to the advanced farmers which I have before me at this annual meeting.

Most of you are acquainted with the success that attended Mr. William Rennie's efforts in this direction at the College Farm. I am glad to find that the principles which he advocated are now being followed by many farmers throughout the Province, and that a measure of success is attending the efforts of most of those who have thus followed his advice. We all know the objects of the cultivation of the soil. These objects will necessarily be found in the answers to the questions which Prof. Roberts put before the Union meeting last year, when he asked the unthrifty plants three questions. He said to them, "Little plants are you hungry, are you thirsty, or are you lousy ?" In the answer to the first question will be found the chief object in the cultivation of the soil, namely, to provide plant food. In the answer to the second question the problem of retaining soil moisture is involved. My intention, however, is not to deal so much with these questions as with the methods involved in cultivating the soil. In different sections various methods are in vogue, as the requirements are different. The principles governing the cultivation of light and heavy soils are different. One of the most important points is to adjust the cultivation to the character of the soil. In dealing with light soils it is not advisable to disturb the sub-soil to any extent or to work the soil deeper than four inches. Keep the soil full of vegetable matter, so as to increase its water-holding power. In heavier soils, however, it is necessary to disturb the sub-soil to a greater depth than four inches. The soil should not be turned up for a greater depth than five inches, but provision should be made by means of a sub-soiler for disturbing the soil below the level. I am an ardent believer in shallow plowing and in uniformity of cultivation, whether it be deep or shallow. One of the advantages of this method is that you do not turn the weed seeds down below the reach of the sun and the air, where they would lie in a dormant condition to come to the surface to trouble you in later years. By shallow plowing you keep the weed seeds near the surface where they will readily germinate and make the work of destruction much easier. Another advantage is that you keep the humus in the surface soil. The keeping of plenty of decaying vegetable matter near the surface is one of the most important advantages from the surface cultivation.

I would employ the clover plant as one of the chief factors in subsoiling. You all know its value as a nitrogen gatherer, as well as a subsoiler. I want to keep the soil as full of vegetable matter as possible, and I, therefore, believe in growing and plowing under green crops in the case of light soils, and also in the case of heavy soils if I felt the mechanical texture of the soil would be greatly improved thereby. On lighter soils, where there may be difficulty in getting the clover to grow, I would recommend buckwheat or rye as a means of supplying this humus.

We find that in the fall of the year our time is so much taken up that we cannot give our land as much cultivation as we should like. By a right system of rotation, however, farmers need not do nearly as much plowing in the fall as many have been in the habit of doing. It is not necessary to plow land in the fall after the removal of the cultivated crops as roots, potatoes, corn, etc. The surface, however, should be worked with a disc harrow or a spring tooth cultivator. In that way you do not plow down the manure left by these crops, and thus put it beyond the immediate reach of the crop to be sown. By this shallow cultivation you leave a loose soil spread like a blanket over the surface, which prevents the escape of the moisture. I would not even plow after the removal of the corn crop. The roots of the corn plants will rot more quickly if left on the surface than they will if they are plowed down. By this means the plant food rendered available by the cultivation of the hoed crops will be left on the surface to aid the growth of the plants during the following season. No matter on what class of soil we have our hoed crops it does not pay to plow our land. We usually get better catches of grass seed if we leave the root land unplowed. I believe it is an advantage, and especially with heavy soils, first to cultivate the surface in the fall of the year and then to rib up with a double mould board plow to preserve the soluble plant food and to give the air, water and frost a better chance to change the unsoluble plant food into an available form. I consider it advisable to keep the soluble plant food as well as the weed seeds near the surface of the soil.

LUCERNE GROWING.

By F. C. Elford, Holmesville.

In his address Mr. Raynor referred to clover as a very profitable plant. Every-one here will agree with him so far as red clover is concerned, but when it comes to lucerne perhaps the number is limited. If on our farm we had given up growing lucerne fifteen years ago simply because we met with obstacles, we should not have been in favor of the plant to-day. In our section we have given up the growing of wheat to a large extent. We want a plant that we can most quickly convert into pork, beef, etc., with the least possible outlay of money and work. I believe lucerne is one of those crops. The longer we grow it the better we like it. Our plan is to follow a hoed crop. We sow twenty pounds to the acre and plant with a seeder. We usually sow with barley. Frequently at harvest when we cut our grain the young clover stands from fifteen to twenty-four inches high.

We do not allow a hoof upon our clover that fall or perhaps the next year, but sometimes we pasture some the second year. As a pasture crop lucerne is unsurpassed. We have had no trouble with bloating, but there is some danger of pasturing it a little too closely. As a hog pasture we have never seen its equal. I read of a man who had twenty acres of lucerne and turned 200 pigs on it in the spring, giving them nothing in addition but water. He sold them directly from the lucerne, and found on weighing them that they had made an average gain of 100 pounds. That would yield a very nice profit. We have followed partially the same system on a smaller scale. Some years ago we took a careful estimate of the cost of producing a pound of pork under this system. We allowed eighty pigs on five or six acres, giving them whey and water. Three or four weeks before marketing we put them in and fed them a grain ration. Summing up, they cost us 2 1-2 cents a pound, allowing for rent of land and everything.

As a soiling crop lucerne is excellent. We have frequently commenced cutting by the first or second week of May. It is then from eighteen inches to two feet high. We continue cutting three or four times during the season, the total crop yielding about twenty tons of green fodder to the acre.

For milch cows it is a particularly good feed—so good, in fact, that I have found you cannot materially increase the milk flow by adding anything to the lucerne ration. Give the cows all the lucerne they will eat and plenty of water, and you will get all the milk they are capable of producing.

Lucerne is more independent of the rain fall than any other crop I know of. Some will admit that lucerne is all right as a soiling crop, but maintain that it is no good as a hay crop. We have heard that many times. We have had it average six tons to the acre of well cured lucerne hay. My father was very conservative, and always said he did not like anything but timothy hay for horses. We made an experiment. Our experience was such that we would just as soon feed well cured lucerne hay three times a day to our working team as we would timothy hay with three gallons of oats per horse added, and that they will keep in just as good condition.

For young stock it has no equal so far as we can find out. For hogs it is a cheap food during the winter season, cutting it up and soaking it well. I have heard the objection that cattle and horses will not eat it, but I venture to say that there is not a head of stock in our stable but will turn from meal to eat that hay.

We have perhaps been the pioneers in lucerne growing in our section. I am safe in saying that hundreds have come to see it. I believe there will be more lucerne hay harvested there next summer than red clover. I do not mean because more lucerne has been sowed, but the hot, dry summers we have had recently have been very destructive to the young red clover. More than half the red clover sown in our township amounted to nothing, whereas I do not know of one failure with lucerne. We can hardly afford to raise red clover, it is too risky a crop. I believe that lucerne has

trebled the yield of hay on the farms where it has been grown. In Huron the average hay crop is a little over a ton to the acre; I believe it is the same all over the Province. Even supposing it only doubled the hay crop, that would mean increasing the yield of hay in Ontario by 3,000,000 tons, which at $10 per ton would total $30,000,000. True, the seed is expensive, but a field will continue to give crops for eight or ten years.

Q.: I find that it heaves out somewhat seriously.

Mr. Elford: It will heave sometimes on knolls that are not covered with snow, but not as much as red clover.

Mr. Fraser: Have you any difficulty in getting a stand?

A: Yes, a little at the start. We as a rule sow it with a nurse crop of barley or oats. I cannot say that we have ever tried sowing it alone, although others have with very good results.

Mr. Tillson: I saw some sown on a sand hill in Bruce. It was sown thick. It was cut five times and was thirty inches long.

FARM FENCES.

By Duncan Anderson, Rugby, Ont.

This is a subject that has often been spoken on, but it is one of the most important that the farmers have to deal with. My experience in farming shows me that by the time I hire my help, keep up my buildings and machinery, pay my taxes and insurance, and keep my fences in repair, the difficulty that faces me is not how to keep my family but how to keep my farm. I must cut off everything possible so as to reduce my expenditure. I think we have an opportunity to do that in the matter of fencing. I have taken the trouble to get up a little estimate showing how much the fences of the Province are worth at the present time. There are in round figures 24,000,000 acres of assessed land in Ontario. Of this 8,000,000 is in bush, 3,000,000 in swamp or marsh, 10,000,000 acres are arable land, and 3,000,000 acres permanent pasture. If we take all the land that is fenced and divide it into farms of 100 acres each, we have 130,000 farms. The fencing for that number of farms is a very important item. If we provide fences for the line and roadway, for dividing the land into 12 1-2 acre fields, for enclosing the paddock and orchard, and protecting the lane, we shall find that it will require all told 1,000 rods of fence for each farm, or a total of 130,000,000 rods of fence. I value that at 40 cents per rod—perhaps 30 cents would be nearer—putting it at that, we have $39,000,000 worth of fences in the Province. It would take all our cheese, butter, heavy horses and our exports of bacon hogs for one year to build these fences. If a farmer has one hundred acres divided into eight fields, etc., and all fenced, he cannot remodel his fences, using the old rails and the balance wire for less than $500. The life of the fence will not be more than 20 years. Interest on that amount would therefore be $400. It to $1,000 for fencing a 100-acre farm, or say $50 a year.
will cost at least another hundred for repairs in that time. So that it will total up

The question is, can part of this cost be avoided? I think it can. If I were living in southwestern Ontario, say in the Lake Erie counties, I would not have an inside fence on my farm at all. Inside fences, after all, are only for the protection of the growing crops against cows, etc., in the pasture field. Does it pay to pasture land is a question that ought to be discussed. The pasture season is so short that it might pay better in half Ontario to grow green crops for the cattle instead of depending on pasture. If we could do away with inside fences even on half the farms of Ontario we could reduce the total outlay for fences by $12,500,000. Even when this is done, the matter of fencing is still a most important one as regards cost, and the question of the sort of fence to be used requires serious consideration. The day of the old snake fence is past. In my opinion a straight rail fence with posts every eleven feet gives the best satisfaction. When we come to wire fences the question of choice is a serious one, but I think it should be of woven wire.

THE VENTILATION OF FARM BUILDINGS.

By E. C. Drury, B.S.A., Barrie.

In speaking on this subject I feel that I am laboring under one disadvantage, namely, that the subject is, comparatively speaking, a new one. Until ten or twelve years ago our stables required, in the great majority of cases, no ventilation; in fact, the chief aim was to reduce the ventilation. The wind came in and did all the ventilating that was needed, and the cattle could testify that the ventilation was very complete indeed. But of recent years the construction of our stables has been entirely revolutionized. Stone stables have given place to wooden ones, until they are now the rule. Closer and warmer stabling of animals is the result, and the tendency has been to run to the other extreme, and do away with ventilation altogether.

I may say at the outset that no perfect system of ventilation has yet been adopted. We are still in the region of theory to a large extent, because so little experimenting has been done with different systems of ventilation. I will attempt to lay down some of the laws that govern the subject, leaving you to apply them in your own practice.

First, as to the aim of ventilation. We know that all animal life depends upon the using of oxygen. We require pure air and air containing its full allowance of oxygen in order to keep up the vital energies. To secure this is the first object. But in addition to this, we know that all animals exhale from their lungs and skins a poisonous gas, and certain organic substances. which if allowed to remain in the air and putrify, gives rise to foul smells. It is therefore necessary to rid the air of carbonic acid gas exhaled from the lungs and of the particles exuded from the skin of the animals. The gas exhaled from the lungs diffuses very readily through the air and is soon distributed all through the stable in very equal quantities. The organic substances are solid and tend to settle to the bottom of the stable. so that there we find the most impure air.

The question we have to consider is, how are we to produce a circulation of air in the stable, leaving as much of the heat as possible, and yet supplying pure air from the outside. There is one law only that we can follow, namely, that warm air rises and cold air falls. We have to depend on that one force. Should the fresh air be allowed to enter at the top or at the bottom of the stable ? I believe it is better to admit it at the top. If it is admitted at the bottom it does not mix readily with the air of the room. but forms a cold layer across the bottom of the stable. and does not accomplish its purpose. My suggestion therefore is that it should be supplied by a flue above the heads of the animals so that they may be permitted to breath the air before it becomes contaminated.

The next point is, how are we to remove the foul air ? I believe the uniform practice where flues have been used is to have the opening at the top of the stable. I do not know but that, personally, I am of the opinion that it would be better to have the flues arranged to take in the foul air at the bottom. If the air passes out at the top, we get rid of the carbonic acid but not of the organic impurities that have settled to the floor. Besides this, the heat is carried away also and lost. But if we wait till this impure air at the top of the stable is cooled off by contact with the fresh air from outside and falls to the bottom of the stable, we shall then be able to remove it, together with the organic impurities, and still retain the heat in the stable.

I believe this is the correct theory of ventilation, but it is only a theory. Where the stable is not overcrowded I think that the ordinary openings along the wall will answer sufficiently well, but where every portion of the space is utilized it will be an advantage to adopt some proper system so that the pure air may go where we want it, and the impure air be got rid of in a proper manner.

HOW TO PRODUCE FRUIT OF HIGH QUALITY.

By W. N. Hutt, B.S.A., Southend.

In order to grow fruit of a high quality it is necessary to begin right. It is the same with fruit as with live stock—we must get the right breed and the right individuals at the very start. This is an important point. It is just as impossible to raise good fruit without considering this as it is to raise such animals as we see at the Winter Fair, now being held here, from inferior stock. It is a little difficult to secure the right kind of nursery stock, because we have to obtain it through dealers. It is therefore desirable to deal with a nurseryman who has considered this point. You will all have noticed that you may plant two trees of the same variety in your orchard, and give them precisely the same attention and treatment, and yet one will bear much better fruit than the other. It is the individuality of the tree. We have to select trees that will give the best individual results. If you cannot be sure of getting this from the nursery, you had better set out Talman Sweets and topgraft later from trees you are quite sure of.

Then it is desirable to get the trees to work as soon as possible. It is just as important that they should not be stunted, as it is important that young beef animals should not be stunted. A tree must be kept growing from the start. In order to effect this we must give good cultivation from the start, and not allow the tree to struggle for years until it begins bearing, and then give it cultivation. This is wrong; we must give the tree attention from the beginning. We also want intensive cultivation. Cultivate thoroughly and often. Clean cultivation is not necessary from the beginning. For the first year or so you may put in any hoed crop such as corn. This will keep the ground constantly stirred. Corn will also provide the shade which the young tree has been accustomed to in the nursery.

Provision should also be made for cover crops so far as possible. What I mean by that is green crops started in July or August, according to the locality, to cover the ground during the fall. These cover crops should consist of clover, vetches, rape or buckwheat. Perhaps the vetch is the best of all. The clover crop may be sown with the last cultivation of the corn.

As soon as the tops of the trees begin to spread, we may know that the roots are spreading also at about the same rate. It is then necessary to take all other crops out of the orchard and give the whole of the land to the trees. Cultivation, however, must be kept up till nearly autumn in each year, and a cover crop sown then to be ploughed under the following spring.

Cultivation should not be continued on into the autumn. If cultivation is kept up too long, the trees will tend to grow too much, with the result that the wood will be soft and will not ripen up. It is therefore necessary to stop cultivation about the latter part of July or the beginning of August, according to the latitude.

In growing apples you will probably notice that when the trees are in full leaf they take up a great deal of moisture from the soil, and that the soil dries on the surface. It is, therefore, necessary to cultivate the surface so as to retain as much of the moisture as possible. When the apple is growing the tree draws very heavily on the moisture of the soil. If the tree cannot get sufficient moisture small apples will result.

It is necessary to have the trees well pruned. This will allow the light and air to get in, so as to properly ripen and color the fruit. In pruning, during the early years you should avoid checking the growth. The object should be to direct the trees rather than to check them. There should be plenty of foliage on young trees.

Spraying is very essential. We cannot raise good fruit in this country without spraying. It is also essential to have your mixtures in diluted and not in concentrated form.

THE PROPER PACKING OF FRUIT.

By Elmer Lick, Oshawa, Ont.

Mr. Hutt has told you how to grow good fruit. It is much easier and more satisfactory to pack apples when you have good fruit to start with. If you follow Mr. Hutt's advice and grow good fruit, the packing is a comparatively easy matter. Still, skill and judgment are required even in preparing the fruit for the market. The first thing to consider is what sort of package should be used. The finer varieties of fruit should be packed in boxes. When barrels are used the best fruit is injured by overpressing.

The fruit must be picked at the right time. This year a lot of the Northern Spys have been picked so early that very serious loss is the result, because the warm weather has ruined their keeping qualities. The question of grading is too large a one for me to deal with here. Great care is necessary in grading, and the work will be rendered much easier by having a large quantity of the one variety. In facing the barrel pick out fruit that is fairly representative of the contents of the barrel. Place the smaller apples on the outside and the larger ones in the centre.

The picking should be done very carefully, care being taken not to bruise the apples by dropping.

Care must be exercised in jarring or shaking the barrel in filling, so as to get the contents well shaken and to avoid slackness and at the same time not bruise the fruit. This is best accomplished by giving a trembling motion to the barrel. In hauling to the station a spring waggon should be used, otherwise the fruit may be bruised in that way. The more the producer can pack his own fruit the better it will be for the trade.

After picking the fruit should be put inside, where it is dry. The barrel or box should, as a means of avoiding mistakes, be stencilled with the name and address of the packer, and the grade and variety of the fruit.

Care must be taken all along the line if we are to succeed in gaining for our fruit such a reputation as its true character warrants. When this is accomplished we may expect that the growers and all who are connected with the industry will receive a full and just return for their labors.

ONTARIO FAIR SYSTEM.

A paper was read by Mr. F. W. Hodson, Dominion Live Stock Commissioner, Ottawa, in which he reviewed carefully the past method of work of our agricultural societies, and outlined what he considered an improved system of work. He was supported in this by Mr. H. B. Cowan of Ottawa, who had been intimately associated with the work carried on in 1901 by the fairs of the Ottawa Valley.

A lengthy discussion of the paper took place. As this subject will be more fully discussed and reported upon at the meeting of the Canadian Association of Fairs and Exhibitions, to be held in Toronto in February, 1902, it is considered advisable to reserve the report of this paper and discussion at the Union meeting, and to give the same in full in the other report to appear later in the year. Copies of this Fair Association report will be sent to all members of the Experimental Union and to all others desiring the same.

AGRICULTURAL EXPERIMENT STATIONS AND KINDRED INSTITUTIONS IN EUROPE.

By C. A. Zavitz, B.S.A., Experimentalist O.A.C. Guelph.

Having been connected with the experimental work of our Agricultural College for fifteen years, and having visited upwards of twenty Agricultural Experiment Sta-

tions in Canada and the United States, I had a desire to visit some of the European stations in order to study the work which they are doing, and to gather all the information which I could regarding the agriculture of some of the European countries. I, therefore, applied to the Minister of Agriculture for permission to go to Europe last season. A leave of absence for four or five months was granted, and on the 4th of May I left Guelph en route for Europe. I landed at Liverpool and went directly to London, where I remained a few days and then crossed over to France.

Agricultural Education in France. I visited a number of the best agricultural schools and experiment stations in France, especially in and around Paris. In studying the agricultural work of France, the special feature which impressed me the most forcibly was the comprehensive system of agricultural education carried on in that country. The agricultural instruction forms a very important part of the general system of the public education. Nearly 4,000 of the rural primary schools of France have gardens or demonstration fields attached to them, which are used for object lessons in connection with the courses of instruction. In the rural elementary schools the pupils are taught the elements of the natural and the physical sciences as related to agriculture. This instruction is furnished in these schools from the time the boys and girls are seven years until they are thirteen years of age, and is divided into the "Elementary Course," the "Middle Course" and the "Higher Course." After the pupils are over thirteen years of age they take the "Advanced Course" in the superior primary schools. Systematic instruction is taught in the Normal Schools along the lines of field agriculture, live stock, and rural economy. It will thus be seen that agriculture forms an important place in the curriculum of the public school system of France.

France not only teaches agriculture in connection with her public school system, but she also has a great many institutions devoted entirely to the teaching of agriculture. The highest agricultural institution in France is the Agronomic Institute, located in Paris. At this institution students are qualified for taking positions as professors in the agricultural schools, as directors of agricultural experiment stations, as agricultural investigators, as chemists, engineers, agriculturists, etc. It is stated that about 90 per cent. of the graduates of the Agronomic Institute follow occupations along agricultural lines.

There are in France nine national schools of agriculture. The most popular, and perhaps the best equipped of these national schools is the one located at Grignon near Paris. This school is very well equipped with land, live stock and laboratories. About eight acres are devoted to experiments with varieties of field crops, application of fertilizers, etc. The national agricultural schools are more practical in their teaching than the National Agronomic Institute. The courses cover periods of from two to two and a half years. The majority of the students, after graduating from the agricultural course, either become teachers of agriculture or follow practical agricultural work.

There are between forty and fifty practical schools of agriculture throughout France. As a rule, there are from 100 to 350 acres of land attached to each school, and the course is made both practical and theoretical. At one time there were also a large number of farm schools throughout France, but at the present time the number is much less than formerly, and there are now only about twelve of these schools in existence. The objects of the farm schools are very practical and are calculated to teach the peasantry of France the details of practical operations on the farm.

After spending about two weeks in France in visiting agricultural schools, agricultural experiment stations, the seed farms and trial grounds of Vilmorin-Andrieux & Company, the mushroom caves of Paris, etc., I entered Switzerland by way of Geneva. The tourist when passing through this most delightful country, in viewing the beautiful scenery of the lakes and mountains, in visiting the glaciers and listening to the avalanches, but little imagines that in this country of wild scenery there are no less than eleven schools of agriculture—seven in which the German, three the French, and one the Italian language is used. It was my privilege to visit three of these schools. Of the different lines of agricultural work in Switzerland I was most interested in that of the investigation of seeds.

Seed Investigation in Switzerland. There are at present upwards of one hundred seed control stations throughout the different countries of Europe. Some of these are devoted to seed control exclusively, while others combine seed control work with that of other lines of investigation. About thirty-five years ago Dr. F. Nobbe of Tharand, Germany, offered to assist the farmers in the selection and the purchase of seed. This was the start of systematic seed investigation in Europe, and Dr. Nobbe has the credit of being the pioneer in this great movement. The first seed control station in Austria was established in 1870, in Denmark in 1871, in Belgium in 1875, in Switzerland in 1876, and in Russia in 1876. One of the most noted seed control stations of the present day is the one located at Zurich, Switzerland, which is under the directorship of Dr. Stebler. At this station seeds are tested for about one hundred Swiss seedsmen, and also for various seed firms in other countries. Thousands of samples are tested annually. The station has several experiment fields, a garden and a greenhouse for practical seed tests. There are several germinating chambers in the laboratory, which can be regulated to different temperatures as required for the germination of different kinds of seeds. There are machines for sifting the seeds, for scratching the outer coats of the hard seeds, etc. The seeds are tested for germination and for purity, and the results are reported on cards which furnish printed information as well as the exact results of the tests.

Scientific Investigation in Germany. I visited ten Agricultural Experiment Stations besides a large number of other agricultural institutions in Germany. I found so much of interest in the German institutions that I spent a very busy month in moving about and studying the German methods of operation. It would be useless for me to even attempt to outline the excellent work is being done by many of the German Agricultural Colleges and Stations. I was certainly impressed with the large amount of scientific investigation which is being carried on along definite lines for long periods of time by many of the German Experiment Stations. The German investigators seem determined to follow up the lines of investigation which they undertake until they secure results which will furnish new information to agricultural science.

Beet Sugar Investigations in Germany and Austria-Hungary. There are about four hundred beet sugar factories in Germany and two hundred and thirty in Austria-Hungary. When in Berlin I visited the laboratory of the beet sugar makers' union of Germany and when in Vienna I visited the Chemical Experiment Station of the Central Society for the beet sugar industry in the Austrian Empire. These are not Government institutions, but are supported by the beet sugar associations. The Austrian laboratories fill a very large and substantial building and they are well equipped with costly apparatus. At each station a large staff of scientists are employed in carrying on investigations in connection with the growing of sugar beets and with the manufacture of beet sugar. After I had spent as long in Germany and Austria-Hungary as my time would allow, I passed into Holland.

Good Home Market for Farm Crops in Holland. There are five experiment stations in Holland. The three which I visited were situated at Groningen, in Northern Holland, Wageningen, in Central Holland and Maastricht in Southern Holland. In passing through this interesting country I found dotted here and there throughout the whole land factories erected for manufacturing farm products into articles of commerce. Starch was being manufactured from potatoes, sugar from beets, paper from straw, fibre from flax, etc. These factories supplied a ready home market for many of the farm crops which are grown in abundance on the rich, well cultivated farms of Holland. After leaving Maastricht in Holland a person soon crosses the border and passes into Belgium, the most thickly populated country in Europe.

Intensive Farming in Belgium. In Belgium I visited three agricultural experiment stations, the principal one being at Gembloux, where some very good work was being done. I was greatly impressed with the possibilities of soil production from what I saw in Belgium. Every available portion of land appeared to be in use, the cultivation was thorough, and the crops were excellent. The average density of Belgium is about five hundred people per square mile, and the average farm is composed

of less than eight acres. This accounts for the intensive form of agriculture carried on in that country.

Agricultural Work in Great Britain and Ireland. After returning from the continent I spent about two months in England, Scotland, Ireland and Wales. I visited all the principal Agricultural Colleges and Schools as well as the agricultural experiment stations throughout Great Britain and Ireland. The work at the Rothamsted Agricultural Experiment Station and also that of the Royal Agricultural Society of England was of special interest. The establishment of institutions in Great Britain for the purposes of agricultural education and agricultural investigation are mostly of recent date. It has been within the last three years that the Government has given direct aid to this work. There is a great awakening throughout Great Britain along the lines of agricultural education, and rapid progress is being made at the present time.

Conclusions from the Trip. From the complete and comprehensive system of agricultural education given in some of the European countries we have much to learn. In carefully systematized and thoroughly conducted scientific research directed along special and well defined lines and continued for long periods of time, some of the European Experiment Stations were pioneers in the work and are leaders to the present day. In the investigation of seed, the improvement of farm crops and the production of beet sugar, in the economical use of land and the thorough cultivation of the soil, in the management of the forests and the construction of good roads we can also obtain valuable lessons from the people of Europe.

Europe is doing much for agricultural science; America is doing much in the application of agricultural science to practical agriculture. I could not find so close a relationship between the scientific and the agricultural world in any of the countries of Europe as I find in America, and especially in our own Province of Ontario. In higher agricultural education for farmers' sons, in Agricultural Experiment Station work for the farmers, in co-operative experiments in agriculture by the farmers themselves, and in a complete and comprehensive system of Farmers' Institute meetings, I found nothing in Europe equal to what we have in Ontario. Our farmers take a keen interest in the application of those methods suggested by science or by practice which tend toward the advancement of agriculture. Generally speaking, the farmers of Ontario own the farms which they manage and hold a position among their countrymen which is good socially, intellectually, and financially.

ADDRESS.

Hon. Sidney Fisher, Minister of Agriculture, Ottawa, Ont.

I am glad to know that in the person of Lord Minto we are welcoming here to-night one who, outside of his official capacity, is greatly interested in agriculture, one who has large estates in the south of Scotland, where the tenants and the farmers of the land are well aware of the interest which their chieftain takes in their agricultural works, and in the many conversations I have had with his Excellency about the fields and farmers of Canada I have always found an extreme interest in a subject which I, as Minister of Agriculture, believe to be the one great interest of our fair Dominion. If next summer Lady Minto comes here you will find that, as Lord Minto is interested in farms and farming, Lady Minto knows all about the gardens and lawns and trees and shrubs, and will be able to take a most lively interest in what she sees on this beautiful spot.

But may I for a moment go on to other things. I assumed a few minutes ago the presence of the representative of the King here to-night. I was glad indeed to obtain the acceptance of the invitation by Lord Minto to come here, for I know from a large experience of this Dominion, from having attended all the great agricultural gatherings of the Dominion for many years—I know that this gathering in the month of December in the City of Guelph is the most important, the most educational, the

most magnificent gathering of farmers which the farmers of Canada know or will know for many years to come. In the Guelph Fat Stock Show we not only have all the specimens of the skill of our breeders and feeders shown in splendid numbers, shown in splendid quality and excellence, to those who come to see them, but we have the splendid education of this work which goes on at this Fat Stock Show by which and through which those who attend it are able to carry away a greater intelligence and greater knowledge of the things which are on exhibition here, and all the ways and means by which those animals have been produced. There are many live stock shows through the country, there are many live stock shows in the old country, and in that of our neighbors to the south, but I have yet to learn of such where the educational feature is introduced which is introduced into this Guelph Fat Stock Show. I want, also, in this connection to tell his Excellency that, in coming here to-night to meet the present students and the old graduates of Guelph College he is meeting the men who are to-day and will be for many years in the future the backbone of this Province of Ontario. You are mostly the sons of the farmers of Ontario, and the farmers of Ontario, wherever they have met in competition with the farmers of other parts of the world or Dominion have shown that in this small Province, in this small small area of the great North American continent, are produced and to-day exist the best farmers and breeders to be found on this continent. I say this with full deference to my friend on the right, Dr. Wiley, with full deference to these gentlemen of the United States who have come amongst us, I say it with full consciousness that when Americans want good stock to improve their herds, they come to Ontario, and when Americans want bright young men to go into their Agricultural Colleges to teach their young men how to farm, they come to Guelph College to get them. I know that the men who have gone through this college have carried its name widely through the world. Some of them have gone to the antipodes, some have gone across the sea, there to help our rivals in the old land; some of them have gone to the United States and are there employed in teaching them how to rival us in our work. This work is now being carried on in a way and by a system which I think is most excellent. The students of this college not only go back to their farms and their work in the practical work-a-day affairs of life to live the problems which they have studied and learned here, but they also form a large proportion of that great staff of institute workers who are constantly moving through the Province of Ontario and Dominion of Canada to teach our young men the greater truths and higher principles of agriculture, and it is largely through the influences of this college and its work that agriculture has attained to a higher plane in the country in which we live. In farms and farming there is scope for the highest education, and farmers may be just as well informed and as great gentlemen as those in any other profession in the land. The farmer was supposed to be a mere clodhopper, a hayseed, a drudge, but to-day we understand and know that the men who are succeeding best on the farms of Ontario are the best educated, the best informed and the brightest of the men who have been through the higher education of the land. This, then, is a thing on which the farmers are to be congratulated. I am especially proud of this fact in my capacity as Minister of Agriculture, and if there is one thing more than another which I hope to promote a little, it is to improve the status of the men engaged in agriculture in our land, and to let them understand, and the rest of the community understand, that they are the equals of any in the land, and that their influence and work is of the greatest benefit to the whole country of which we are so proud. It is not unreasonable to think so. If you examine our trade and commerce you will find that the largest proportion of it is the commerce of our fields and flocks. If you examine the wealth of the community you will find that it is produced from what is wrung from the soil of our country by the men who dwell upon that soil. If, then, we can increase the intelligence of those laborers and give them knowledge of how best to do their work, we are doing more to advance our country than any others who may be engaged in any work.

I am glad to see on my right hand, a professor of the Agricultural Department at Washington. I understand that last night you heard him in this hall, but I was charmed

this afternoon to hear from his lips one of the most practical addresses on an agricultural subject, which I have ever been privileged to hear. I am glad to welcome one of our neighbors from the south. Being of the same race, speaking the same language, having the ties of relationship so closely bound together, lying alongside of each other as we do on this American continent, and sharing it between us, it is well that we have visitors from that land amongst us at such gatherings as this. It is well that we should tell them how much we value the assistance they give us in our work, and tell them how gladly we would have them share in anything we can do to help them in their work. We, in Canada, lie, as a portion of the great British Empire—an outlying portion, as far as the heart of that empire is concerned—but we lie alongside of the other half of the English-speaking race to-day comprised in the United States, and it is one of the best works for the future of this world, that the people of Canada to-day are occupying that position, enjoying that advantage are the link that binds together the two portions of the British race, and keeps them in sympathy with one aspiration, in those things which are working for the good of humanity, and which will make each and both of them do more for the progress and humanity of the world than each without the other could possibly do.

You know, sir, I have always praised this college wherever I have been. I was glad to-day to hear Mr. Zavitz speak of his tour in Europe. I was specially glad of it because the conclusions he reached were largely the conclusions I had reached, and, therefore, I was able to endorse them and think them very good indeed. I have no hsitation in saying that although in the older lands they are able to spend more money and apply more time to scientific investigation and original research in regard to scientific work, in none of the colleges or organizations in favor of agriculture in those lands are the actual workers on the farms so much helped, so much brought in contact with the truths that are to-day constantly developing in agricultural progress, as the farmers of Ontario are brought into contact with agricultural progress by this means and by your college. The Ontario Agricultural College at Guelph here may be congratulated on the work it is doing and in the advantage which it is to the whole community.

ADDRESS.

His Excellency the Earl of Minto, Governor-General of Canada.

Mr. Chairman, Ladies and Gentlemen,—I feel that I almost owe you an apology for coming to see Guelph and this great college at such an inclement time of year, but I think I must put some of the responsibility on my next door neighbor, Hon. Sidney Fisher, who is always persuading me to come here to the Fat Stock Show. I hope that at any rate it may not be my last visit to Guelph. I have come here particularly, of course, to see the Fat Stock Show; I have come here to learn. I have heard a great deal of the excellent instruction that is given here, and I wanted to see for myself not only the exhibition of stock, but to learn for myself the system upon which the instruction at your Agricultural College is given. I hope at some future time I may be able to come here with her Excellency, Lady Minto, in the month of June, as your Chairman has suggested—(cheers)—and I suppose I may be permitted to share a sandwich with some of the 30,000 farmers—(cheers)—who come to visit the college annually in the month of June. My time is very much taken up. Last year I was in the Klondike, and this year I was wandering about Cape Breton and Nova Scotia on an official tour. Next year I have to go to the Coronation, a great historical event which one would be sorry to miss, and that will again count me out from paying visits to other parts of Canada. I should like to make these other visits, however, during the remainder of my appointment here. As it happens, I have seen a good deal of the Dominion. I was here, as a good many of you know, seventeen years ago, and formed a great many warm friendships, which I have been able to keep, so that coming here on this occasion is to a great extent a

coming home to me. When my term of office is over, I assure you I shall always look back upon it with feelings of strongest affection.

Your Chairman, Dr. Mills, has alluded slightly to your military capabilities, and what you owe to the old country. As it happened, in 1885, I had a good deal to do with the Canadian soldiers in the Northwest, and I have always stuck up for them and their valuable qualities, and, though I do admit that in a military sense you are placed very well as regards the old country, there is one thing you ought always to realize, one and all, and I cannot say how important it is, that the old country is pledged to defend you with all the forces of the Crown. I will never join in saying that Canada has given nothing to the old country, when we look upon all the high courage she has shown and all the valuable lives she has sacrificed in South Africa.

I hope I may have an opportunity to-morrow of going over the Live Stock Show here. I have some excellent tutors to look after me in Dr. Mills and Hon. Sydney Fisher, and I feel that my visit here will benefit me in the instruction which you are so very well able to give me.

WORK.

By Miss Laura Rose, Guelph, Ont.

My remarks this afternoon will be on a subject common to us all. It is that which is the panacea of nearly every ill that flesh is heir to. That which most effectively and quickly heals the wounded, broken heart, gives confidence to the weak, and keeps the strong from erring. Have you guessed the magic word ? It is a short one—one very familiar to us all—the little word "work." Our whole duty is to move, to work, in the right direction. We must keep pace with time or we shall be carried on with it—a dead load. An Italian philosopher expressed in his motto that time was his estate, an estate, indeed, which will produce nothing without cultivation, but will always abundantly repay the labors of industry and satisfy the most extensive desires, if part of it be not overrun with noxious plants, or laid out for show rather than use.

Nothing gives the character so much strength and energy as a definite object. Nothing is more productive of success and happiness than that a person should be in harmony with her work, that she should have the faculty of work, and be able to do it thoroughly and well. Ruskin said, "There can be no healthy thought without labor, and no happy labor without thought." If we, as housekeepers, would put more thought into our everyday work, the drudgery of it would be largely removed.

Many women bewail their lack of talent, and that they can do no great work in this world, and these very women are makers and keepers of homes. What more beautiful mission. What more useful or coveted talent than that of making a home, where rest, peace, and happiness abide. To keep a home well and to make its influence strong for good, is great enough in itself to fill the largest life.

True, some women have an intense appetite for work and they feed it well. They certainly get Kingsley's reward, for he says, the greatest reward of having done well is having more work to do. It is a known truth that only busy women have any time for extra or unexpected work.

Of course, it is part of the very idea of work that it should involve labor and weariness. We need to fully reconcile our minds to this, so as to work with patience and perseverance. There are various helpful considerations. To many women work is a necessity, but in working they are carrying on the order of the world. Without work the world would have been a wilderness, and without work into a wilderness it would soon return.

It is a thought full of incitement and encouragement that we are of use in the world, that we are co-operating towards good. The consideration also arises that while we work our labor returns in blessings to ourselves. We are adding to our culture. We are promoting our own development. Above all, there is the supreme satisfaction of know-

ing that in work we are following the will of God. He condescends to employ us as fellow workers with himself. He has made work a law to himself and has assigned it as a law to us. The highest title which he vouches is that of "a good and faithful servant." Such thoughts cannot make hard work other than hard work, but they will save us from carelessness and indifference and will cause perseverance, cheerfulness and hope.

Oh, all who labor, all who strive,
　　Ye wield a lofty power;
Do with your strength, do with your might,
　　Fill every golden hour;
The glorious privilege to do
　　Is man's most glorious dower.

Then to your country, to your God,
　　To your own self be true;
A weary, wretched life is theirs
　　Who have no work to do.

THE EDUCATIONAL VALUE OF SEWING.

By Miss Mary Urie Watson, Principal Ontario Normal School of Domestic Science, Hamilton, Ont.

The school is not the only factor in the education of the individual, that is, in the development of his powers. Everything he comes in contact with contributes. It is carried on in the home, and by society before school days begin, and long after they end. The result of this development is conduct, which is good, bad, or indifferent, according to the influences which dominate the process.

The average father of all ages has desired to see his children climb higher than himself, and to this end he has striven to guide and control the process of their education, during the plastic years of childhood and youth, while they were dependent upon him. This desire brought schools into existence, and out of it have grown the various school systems of to-day. All generations have striven towards the same end, but no two have agreed as to what constituted the best conduct, and the best means of securing it. Therefore, no generation has been satisfied with the educational methods of its predecessors, and succeeding generations will surely try to improve upon ours.

Since, then, improvement is the order of the day, let us consider for a moment Huxley's definition of a good education, "That man, I think, has a liberal education, who has been so trained in youth that his body is the ready servant of his will, and does with ease and pleasure all that as a mechanism it is capable of; whose intellect is a clear, cold, logic engine, with all its parts of equal strength, and in smooth working order, ready, like a steam engine, to be turned to any kind of work, to spin the gossamers as well as forge the anchors of the mind; whose mind is stored with a knowledge of the great fundamental truths of nature, and of the laws of her operations; and who, no stunted ascetic, is full of life and fire, but whose passions are trained to come to heel by a vigorous will, the servant of a tender conscience; who has learned to love all beauty, whether of nature or of art, to hate all vileness, and to respect others as himself." In other words, it is the welding of the human clay and spirit into a single power for good in the world. Imagine this country of ours filled with people built on these lines.

Why should we not study as enthusiastically to develop first class men and women as to develop first-class sugar-beets, or first-class stock? Notice Huxley's demand for right conduct as the crowning result of education, then notice how it is to be achieved—by training in youth and by training the physical and moral powers as fully as the mental. If we agree with him, it is evident that our schools must do their share in laying the foundation of such an education, for a large part of youth is spent in them.

Well, you say, but how are we to set about the improving of our schools ? What do you do when you seek to improve your house or your stock ? Consult the specialists, the men who make that sort of thing their business. Exactly. Then let us do the same thing with regard to our schools. For years the educational specialists have been saying to us, we must weave the home interests more closely into the school interests, and bring the school interests more in touch with the outside world. They have been saying, give the children more than book knowledge and mental discipline, give them an all-round training. Train the body to respond promptly to the mind's order, train the mind to receive its impressions and give its orders accurately, and above all train the will to direct the mind aright. They have been saying, do not depend so much upon books, do not spend so much time telling the children about things. Give them the things, and let them work on them with their bodies and their hands. They will find out more in five minutes than you can tell them in as many hours. They will learn more, learn it quicker, and learn it better. We have been paying heed to the specialists, and are beginning to carry out their ideas. The greatest step in this direction has been the introduction of Manual Training. Henry James says : "It is the most colossal improvement which recent years has seen in education," with its laboratory and shop work, and its work with the homely utensils of pots and pans and needles and thimbles. There are many forms of it—kindergarten work, cord work, paper-folding, clay modelling, basketry, drawing, painting, sewing, whittling, carpentry, iron work, and domestic science. Each has peculiar features which make it especially suitable for certain stages of a child's development, under certain conditions.

I have been asked this afternoon to talk on sewing, which has the needle for its special tool. There are many reasons why it is a good form of manual training for girls of the middle and upper school grades. We women are agreed that it well for a girl to know how to sew. True, in these days of sewing machines and ready-made garments, she may need to sew very little, but she will have to buy, and only sewing experience will enable her to judge whether the quality of the material and sewing in her purchase will yield value for the money expended. Ignorance on these points is costly. The problems of the sewing lessons keep the school and home in close touch, preventing that separation of interests which so often weans a girl from home affairs, and aiding the girls to realize that school life is but a preparation for the fuller home life of the woman. Again, it is one of the forms of manual training easy to introduce into school work. It requires no special room, very little special equipment, and is inexpensive to carry on. Finally, we want sewing in our public schools, not so much because it will help to make our girls more handy and practical for domestic life, and better skilled for certain trades, but because it will help us to cultivate their intellectual powers. Properly taught, it engenders a habit of observation, a knowledge of the difference between accuracy and vagueness, which wrought into the mind remain there as a life-long possession. It confers precision, because, if you are doing a thing, you must do it definitely right or definitely wrong. It gives honesty, for when you express yourself by making things, and not by using words, it becomes impossible to dissimulate your vagueness or ignorance by ambiguity. It begets a habit of self-reliance ; it develops a power of facing problems and surmounting obstacles ; and it keeps the interest and attention cheerfully engaged and reduces the teacher's disciplinary functions to a minimum.

The choice of work must depend upon the age and capacity of the children. Two things, however, seem certain : First, that sewing should not be given to the youngest grades; the needle requires too fine adjustment of finger and eye muscles for little children; and, second, that finished articles should be made all through the course. A course of sewing with nothing to do but sew on six-inch squares, and stick them in a book, is dreary work. These model squares have their place, but it should not be the chief one.

Methods also differ with the age of the children, and no two classes can be taught in the same way. For the little children, large wool needles, wool, and soft, coarse canvas are the principal materials. The stitch-forms are happily learned in order to decorate small mats and other things interesting to children of their age. Pictures and cloth and fibre samples ; demonstration frame and blackboard ; talks, and, above all, questions

are pressed into service with the object of securing control of the fingers and cultivating observation and expression. In the older girls, we seek to cultivate their powers of accurate observation, expression, and reasoning ability, together with precision of work.

Probably a brief description of the work in a recent class of mine will illustrate these points. There were thirty, of the grades next the High School. They could have but 36 lessons before going to the cooking class ; most of them knew practically nothing of sewing, but they were expected to show fair samples at the end of the year, and, of course, they wanted to make things. The proposition was made, that if they were willing to study the stitch-forms thoroughly first, they would be able to make small models of the cooking class uniform by the end of the year. They enthusiastically voted to do so.

The first lesson was devoted to getting definitions and terms, because no teacher can do individual work with thirty pupils, and because we had to obtain careful observation and accurate descriptions as speedily as possible. (The description was illustrated with samples of work and the blackboard.) The girls enjoy the lesson, and at the end of it they knew the difference between stitch and space, a line of sewing and a sewing-line, and between straight and slanting sewing. There was nothing dictated, the girls thought out their definitions, guided by questions and tests of the answers on blackboard or frame. In the next lesson we studied cloth—found what it was made of. Now the threads were put together; the difference between warp and woof, and the different kinds of edges, and ended by making a piece of cloth with wool on a card.

The following lessons were given to the study of the stitch-forms : Running, basting, stitching, back-stitching, two runs and a back-stitch, gathering, overcasting, overhanding, hemming, in the order here given. In each case a large sample of the stitch correctly made was studied by the class. They were required to describe it ; to form a rule for making it ; and to make it with colored thread on a small piece of coarse cloth, having stitches large enough to judge of their uniformity. These models were pasted into a book, with the description and rule written opposite, for reference in succeeding lessons. The next lessons were in preparation for construction work. In them they studied and practised similarly cloth-cutting, cloth-folding, and a seam.

Then we made things—a bag, cap, sleevelets, pot-holder, and apron. We had large models and studied them as carefully as the stitch-forms. If there was anything new in the article, e.g., a fell, bias-binding, band, buttonhole, etce., we studied it in detail, and made a model for the note-book. A plan was made of the article, noting measurements, kinds of sewing, etc., as clear as the instructions on a Butterick pattern. Finally, the girls cut and made the article, 1-3 scale, to their own measurements.

The last two or three lessons were given to darning and patching. But here the doing was faced as a problem, which the class solved by the light of experience gained in previous lessons.

The course was carefully graded, so that each lesson was but a step in advance of the previous one, and a preparation for the next. It was seldom necessary to take a piece of work and show with my own hands how it should be done, and the rapidity of progress after the early lesson was passed was surprising.

Many of you will think of modifications necessary for differing classes, especially those needed to prevent the early lessons from being the grind they were in this case. There are innumerable articles which can be made in the school room, if only the teacher can adapt them.

All through I have tried to emphasize the need of a good teacher. A clever seamstress alone will not do. We must have teachers' training here as well as for arithmetic or history, and my hope is that you will encourage those whom you desire as sewing teachers to prepare themselves especially for the work.

ANNUAL REPORTS

OF THE

DAIRYMEN'S ASSOCIATIONS

OF THE

PROVINCE OF ONTARIO,

1901.

DAIRYMEN'S ASSOCIATION OF EASTERN ONTARIO,
DAIRYMEN'S ASSOCIATION OF WESTERN ONTARIO,
THE DAIRY SCHOOLS OF ONTARIO.

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1902.

By Sections 5 and 6 of Chapter 17 of the Ontario Statutes for 1900, the names of the two Associations known as the Cheese and Butter Associations of Ontario were changed to, and will hereafter be known as, *The Dairymen's Association of Eastern Ontario* and *The Dairymen's Association of Western Ontario.*

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TORONTO.

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OFFICERS FOR 1902.

DAIRYMEN'S ASSOCIATION OF EASTERN ONTARIO.

President .... D. DERBYSHIRE, Brockville.
1st Vice-President .... JOHN MCTAVISH, Vancamp.
2nd Vice-President .... L. L. GALLAGHER, Wilton.
3rd Vice-President .... JOHN ECHLIN, Carleton Place.
Secretary .... R. G. MURPHY, Elgin.
Treasurer .... P. R. DALY, Foxboro'.
Auditors .... MORDEN BIRD, Stirling. / F. W. BRENTON, Belleville.

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" 2—WM. EAGER, Morrisburg.
" 3—J. R. DARGAVEL, Elgin.
Div. 4—JAMES WHITTON, Wellman's Corners.
" 5—T. B. CARLAW, Warkworth.
" 6—HENRY WADE, Toronto.

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L. A. ZUFELT .... Chesterville.
A. P. PURVIS .... Maxville.
JOHN B. LOWERY .... Frankford.
J. H. BENSLEY .... Warkworth.
HUGH HOWEY .... Newburg.
R. W. WARD .... Foxboro'.
A. B. RABB .... Brockville.

DAIRYMEN'S ASSOCIATION OF WESTERN ONTARIO.

Hon. President .... HON. THOS. BALLANTYNE, Stratford.
Hon. Vice-President .... JOHN PRAIN, Harriston.
President .... AARON WENGER, Ayton.
1st Vice-President .... JAS. CONNOLLY, Porter Hill.
2nd Vice-President .... J. N. PAGET, Canboro.
3rd Vice-President .... ROBT. JOHNSTON, Bright.
Secretary-Treasurer .... GEORGE HATELY, Brantford.

DIRECTORS:

Div. 7—I. W. STEINHOFF, Stratford.
" 8—HAROLD EAGLE, Attercliffe Station.
" 9—JNO. H. SCOTT, Culloden.
" 10—THOS. BALLANTYNE, Jr., Stratford.
Div. 11—T. B. MILLAR, London.
" 12—JNO. BRODIE, Mapleton.
" 13—A. F. MACLAREN, Stratford.

Representatives to Industrial Fair, Toronto .... A. F. MACLAREN, M.P., J. N. PAGET.

To Western Fair, London .... T. B. MILLAR, JNO. R. ISAAC.

DAIRYMEN'S ASSOCIATION OF EASTERN ONTARIO

ANNUAL MEETING.

The twenty-fifth annual meeting of the Dairymen's Association of Eastern Ontario was held at Whitby on the 8th, 9th and 10th of January, 1902. Every effort was made by the Mayor and citizens of the town to assist the members of the Association in making the convention a success, and the general opinion of those in a position to judge was that no better meeting of dairymen has ever been held in the Province. A marked feature of the sessions was the eagerness to ask questions shown by many in the audience, which proved that the topics selected for discussion were timely. The townsfolk crowded the Opera House on both evenings, and the happy combination of popular and practical addresses then given was warmly received. The presence of both the Dominion and Provincial Ministers of Agriculture also lent interest to the gathering.

PRESIDENT'S ADDRESS.

By D. Derbyshire, Brockville.

It is a great pleasure for our board to hold this our twenty-fifth annual convention in this enterprising town of Whitby, and I desire, on behalf of our dairymen to thank the Mayor and citizens for the cordial reception given us. I am sure you will be delighted to know that the Hon. Mr. Fisher, Minister of Agriculture for the Dominion, has kindly consented to open this convention, and identify himself with us in our great work of making a finer quality and a larger quantity of butter, cheese and bacon for the British market than ever before.

This is the first important dairymen's meeting ever held in this section, and we do hope we will be able to impress you more fully with the vast importance of our work. We made 2,194,686 boxes of cheese in 1901, valued at $17,500,000. We exported from Montreal up to the close of navigation 1,791,613 boxes; since the close of navigation, 102,439 boxes; from Portland, 200,634 boxes, and we have on hand 400,000 boxes, Prices for cheese have not been so high as last season, and we made more poor cheese last season than formerly. But our large, well-managed factories never made as many fancy goods as during the past season—good style, good boxes, good weights, everything correct—a joy to handle, so that we feel quite cheerful over the season's business in cheese. We can all rejoice over our creamery butter, for never in the history of our country have we made as fine quality. We made 670,893 packages, valued at $8,000,000, made us as follows : 410,893 packages exported from Montreal till close of navigation. Since the close of navigation, 35,000 packages have been shipped. We have on hand 25,000 packages, and we consumed 200,000 packages. So our cheese and butter came to $25,500,000, or a gain of $500,000 over 1900, and to this we must add our hog products, $14,500,000, which makes $40,000,000 that our dairymen have produced in 1901, and we are in better position to make more next season. Quite a number of our factories have been greatly improved, and we believe a large number more will be greatly improved before another season begins. A large number of our makers are attending one or other of our well equipped Dairy Schools this winter. Our dairy farms have more fertility, because of feeding everything out at home, and our people are becoming better all-round dairymen, so the future for our business looks bright. Hon. Mr. Fisher, our Dominion Minister of Agriculture, deserves great cre-

dit for the introduction of cold air into steamships carrying cheese this last season. Never in our history have we placed our cheese on the British market in such nice condition, and we do hope he will have this system greatly enlarged and improved. We still want from the Government refrigerator cars, with plenty of ice to carry our cheese to Montreal, the same as we have for butter. Thousands of fancy cheese are greatly injured in transit from the factory. We want this attended to this coming season. We ask the co-operation of sister dairy associations in getting quicker transportation in proper, clean cars, well iced, so that our product will be delivered in finest condition. It is ruinous to have our cheese hang around three or four days in some old, dirty, open car, and we must use every effort to remedy this. We are anxious to arouse our friends, so they will all go heartily to work to improve all along the line. With the advantages we have for education and instruction, it seems a pity to have an ordinary maker or poor factory. We should have the best facilities, because we must have all our cheese and butter finer in 1902. We must hold the leading position, and this can only be done by improvement.

I feel sure I can count on the hearty co-operation of every dairyman in Eastern Ontario to make one supreme effort during the coming season. I can assure you that the market never was in as good shape for using fancy goods as to-day, and I cannot remember when ordinary goods were as hard to place. We want every dairyman in our eastern section to promise that he will improve. Let that poor old cow, that never made a dollar, go. Improve your stables, build a silo, and have plenty of the best food for every day in the year. Improve your factories, and especially your curing-rooms. See that your maker attends the dairy school. In short, take hold earnestly to make the needed improvements so we can step right out of the way of any of our competitors. We can easily do this by uniting, for we can make the finest goods in the world, and it is our duty to do our very best, when so much depends upon our united action. With a little care we can also cheapen the cost of production. This is a matter which every dairyman should carefully study. We have had more trouble getting sixteen ounces for a pound this last season than ever before and our English friends receiving our goods have complained bitterly about weight. We might as well face this question now and make up our minds that if we want the best people for customers on the other side we must give them fancy quality, nice style and up weights, or they will look elsewhere for their supply. Let us understand this fully and apply the remedy by putting ourselves in such a position that we can turn out fancy goods every day. Do not hire a maker because he is cheap, but because he has the ability to do the best work. Do not try to get along another season with that old vat, press or curing-room, but put them right before you start the season. We have quite a large number of factories that have never made fine goods, never given weights, never had a cover for their waggon when delivering cheese; having trouble with every buyer, always thinking everybody dishonest except themselves, wanting the rules of our cheese boards changed often, instead of commencing right at home to put everything in the best shape for doing a good business. Put your factories and everything else around you in finest shape, educate your patrons how to care for their milk, and your trouble about selling cheese will soon disappear. We want better boxes, heading the best quality and properly seasoned. A large number of cheese have been greatly injured by using green heading.

We sent some butter and cheese to the Pan-American Exposition, and as on all former occasions, we carried off nearly all the prizes. Personally, I was not much in favor of sending any goods there, because we cannot sell them a pound of cheese, butter or pork. They fix their tariff to shut everybody out and I think our policy should be to shut them out; in other words, buy as much from them as they buy from us and not a penny more.

We made a change last season, having two instructors do nothing but instruct our makers, and I would like to add another instructor this year, if we can raise the funds. All our instructors have done their work very satisfactorily. Hon. Mr. Dryden, Minister of Agriculture, has aided us in every possible way. Prof. Robertson

has been as helpful as formerly. Mr. Ruddick, chief of the dairy division, has rendered good service. The secretary and treasurer have been careful and painstaking, and all have worked together for the upbuilding of our great national industry. The $40,000,000 we produced this last season could easily be made fifty this coming season by a little extra care on the part of everyone concerned, and then every industry in our country would flourish on account of the increased buying power of our people. We have made steady advancement and healthy lasting expansion in our dairy work, and we want this to continue. I have looked forward to this 25th annual convention to be held in your enterprising town with great pleasure. Your schools, churches and public buildings are very handsome; your merchants and manufacturers are up to date; the Ontario Ladies' College, that has been doing such splendid work is situated here. I am sure you are justly proud of all these; but our business here is to draw your attention to the greatest industry in this country. I mean the dairy business. By dairyman we mean a farmer who cultivates his farm the same as an ordinary grain farmer does, only better, and feeds all his crop at home and makes more money, besides enriching his farm so he can grow better crops each succeeding year. Once more let me urge all our friends to work together, having only one object in view, that of bettering the condition of our fellow workers and building up our great Dominion.

Henry Wade: I am delighted that at last we have succeeded in bringing the convention into district No. 6. As representative of this district on the board for twenty years I have attended all the gatherings of the Association, and I feel persuaded that this will be one of the most pleasant and profitable ones in the history of the body. Of course the district is not so much a dairy section as those further east are. We have been paying attention chiefly to live stock and grain raising, and other lines of farming. But of late dairying has been developing, and already some good creameries have been established. I was one of the pioneers in starting dairying in this section of Ontario—a little further east of here—and I have been pleased to see the extraordinary development made in both cheese and butter making since that time. I have been proud, also, of the fact that Canada won so many prizes at the Pan-American Exposition, and am sorry that we did not exhibit even more fully.

L. L. Gallagher: One of the reasons for the cheese not being so good this year was the fact that in many cases the rennet used was not of the best quality.

The President: That may be, but there were other reasons, and some of them could be easily controlled if patrons and makers would rise to the occasion. After all, we do not need legislation so much as we do to get the hearts and heads of the people right. More education, mental and moral, is required. Our Dairy Schools and our inspectors are helping wonderfully along these lines. Every cheese and butter maker, properly equipped, is an educator. However, the weighers and examiners also have their place in this educational plan, and I am hopeful that between their work and the work of this Association and other agencies, the proper change of heart will be brought about.

COMMITTEES.

The following committees were appointed:

Business—Mayor Ross, Fred. Hatch, R. G. Murphy.

Nominations—J. R. Dargavel, James Whitton, and Wm. Eager.

Legislation—Edward Kidd, M.P., R. G. Murphy, Wm. Eager, and H. Wade.

DEVELOPING A DAIRY HERD.

By Joseph E. Gould, Uxbridge.

When I was introduced to Farmers' Institute gatherings by Major Sheppard he always told me that if they ever got to Uxbridge and saw a man going about with an ear of southern corn protruding from one pocket and a copy of "Hoard's Dairyman" sticking out of the other, that they might be sure it was Joseph Gould. (Laughter.) Now a man should always stick to his best friends, and these two things mentioned by the Major have been my very best friends in the dairy business. And these two ought to make any man who has to handle cows successful. I have been into this thing for about eight years. I started as a dairyman with hardly any knowledge, and therefore I had few, if any, prejudices to overcome. I simply had to find out for myself the best things to do or to avoid..

At the very beginning I wish to impress upon dairymen the importance of having the best cow you can procure. It is very rare that you can pick up a good dairy cow by ordinary purchase, as a man who has a really good animal is not likely to let her go. The best plan is to get a good cow, and raise your own stock, culling as often as is necessary. I have 52 head of cattle, young and old, and 34 of them are now milking. There is only one cow in that lot that I have not raised myself during the last eight years. I have killed many, because they have not come up to my standard as milkers. That standard is 275 pounds of butter per annum, and any cow that does not come up to that mark is of no use to me. If a cow in her fourth year does not give 275 lbs. of butter then someone else has to feed her. (Applause.) I suppose that the average of the Province is not over half the amount required by my standard, and if that be so, then I am positive there can be no profit in it.

The next important point to be considered is the feeding and care of this selected cow. Proper feeding should be carefully studied by the dairyman. About 80 per cent. of the cows of this Province are not producing the amount of butter they should, and this not so much of their fault as through the bad management of their owners. There are some dairymen who do not appear to have enough brains to run a wheelbarrow. (Laughter.) If cows are not properly fed and housed, how can any man expect profit from them ? In my own case, I keep my cows in the stable all the time. The temperature is never lower than 40 degrees or higher than 65 degrees. I keep my stables as light as this hall—no dark, dreary stables for my cattle—and I give them all the good food they will have.

The trouble with many dairymen is that they do not train their cows when they are young to be persistent milkers. Why should I keep a cow that will give milk only eight months of the year, and let her run dry and just board with me for four months ? There is neither profit nor sense in that. The saying is true that "The nimble nine-pence soon overtakes the slow shilling." I have cows that have milked every month in the year, and some that have been idle not more than four or six weeks. It is the persistent milker that pays.

My cows are given as much ensilage as they will eat, besides bran and oats. I feed bran the year round, and gave ensilage 351 out of the 365 days in last year. To be successful in dairying you must feed the year round. You say there is trouble in getting your cows to come home for feeding. There is no trouble whatever in the matter if you feed regularly and properly. My cows come home at the same time every night, of their own accord, because they know that the feed will be waiting for them when they come. It does not pay to keep cows walking up and down the field looking for pasture and tramping it down at the same time. I can supply feed at less cost in other ways. Ensilage is the basis of my feeding. I had 17 acres of corn, which gave me last season 225 tons of ensilage. Down at the front here, where you are freer from frost than we are, you can raise a larger variety of corn, and could produce as much on 14 acres as I have raised on 17. I have only 12 acres of pasture on the whole place.

I consider it much cheaper to grow corn for feeding than to have cows wandering about the pasture field.

Let me give you a few illustrations from my own herd. I have 31 cows. One of these gave 7,253 lbs. of milk last year. She is a Grade Durham, and her milk tests about 3.6. Another cow gave 7,271 lbs. of milk. A three-year-old gave 5,682 lbs. Another one, which is the most persistent milker I have, milking 12 months in the year, gave me 9,015 lbs. Another cow gave 1,252 lbs. of milk in May, 1,100 lbs. in June, 1,016 lbs. in July, and 1,031 lbs. in August. She gave a total of 8,359 lbs. for the year. A pure bred Jersey gave 8,484 lbs.

The total production of my herd of 31 milkers last year was 146,730 lbs. of milk, or upwards of 70 tons. The average test of the herd, as shown in the returns of the Cannington creamery, ranged from 4.1 to 4.42 of butter fat for the year. The amount of butter made was 6,968 lbs., and the cash returns from the butter sold amounted to $1,280. From this amount must be deducted $65 for freight on shipping the cream, but to this should be added $300, as the value of skim milk fed to hogs. That made my total returns from the herd $1,500. That return was secured from a farm of 110 acres. I could not have done the same ten years ago, because the farm has meantime been enriched by feeding everything on the place. I do not really have to buy anything for feeding my cattle, because I trade oats grown on the place for bran obtained at the mill, so that, as I say, the returns from my herd, worth $1,500, were all obtained from the product of a farm of 110 acres.

Mr. Murphy : Why do you not raise your own pigs as well as your cows ?

Mr. Gould : Because it would not pay me on my small place to keep eight breeding sows. I can do better by buying the small pigs, when I can get them for $2.50 or $3 when about six weeks old. I have to buy feed for the pigs, but not for the cows. I trade oats for the bran, and so do not have to buy even that. (Laughter and applause.)

The President : Lewis Harris claimed to keep 30 cows, besides a large number of hogs, on 100 acres, and that in the days before we had corn ensilage. I went over there into New York State to visit him, and was splendidly treated by that grand old man. He met me at the station with a covered buggy, and brought me to his fine home —handsome wife, a beautiful daughter, splendid piano, everything elegant. (Laughter.) Just before five o'clock we went to his barn, and along came the cows, walking right up to Mr. Harris and rubbing their heads against him, as if to ask him to open the barn door. He opened the door, and in went Betsy, and Mary, and Jane, and all the rest of the herd. The milkers were ready, but before doing their work all had washed their hands with soap and water, and had used a clean towel. Every milker had his or her own cow to milk every time. They had to mind this, for a cow is as jealous as a woman. (Laughter.) Each cow wanted to have her own milker, and wished to be milked exactly at the same time each day. After milking, each cow's milk was put on the scales, and Betsy was duly credited with her yield. Mary with hers, Jane with hers, and so on. Every item of gain or loss was noted. Mr. Lewis also kept a bacon account. He was getting about $500 or $600 a year for his swine product. He had the best of everything to sell, and he had also the best of everything to eat at home. He was making money in dairying because he had selected the right kind of a cow, and was giving her right treatment, and the animal was given a fair chance to do the best she could. It pays to keep a record of what your cows are doing for you. It means more system, and more sound practice. I have attended many factory meetings, and have tried to get patrons to see the benefit of knowing just what an animal or herd is doing. I have gone to the blackboard, and have shown them that John Jones was getting only $14.92 per cow, while his next door neighbor, with better judgment and wiser practice, was getting $60 per cow. One of these $14.92 men once said, "Dang the cows ; they're no good, anyway !" (Laughter.) I think I can hear the $60 man say, "The cow is the salvation of the country." This last man bought plenty of bran. saved all the droppings in his stable to replenish fertility. and housed his cows carefully. Every dairyman in this country ought to do just what Mr. Gould has told you to-day. With the added prosperity

we would soon pay the national debt. It would mean added wealth not only to the farmers, but also to our towns and cities. What Mr. Gould has done every other dairyman may also do by following similar methods.

Mr. Gould : The value of bran for manurial purposes depends a good deal upon the condition of the stable. We now cut all our straw as we thresh it. That cut straw is used as bedding, and everything that drops from the cow is taken up by it. That manure is taken to the field every day. That is why I can produce more from my fields than my neighbors can.

The President : If you feed a ton of bran to the soil in the manure, the nitrogen which you replace is worth more, at the price nitrogen is valued, than what you pay for the bran. It seems strange to say it, but where nitrogen is badly needed in the soil what I have said as to the great value of the manure from bran holds strictly true. Then there is the benefit derived from increased crop. Give your cows plenty of bran, and you will not need to send the dog after them at milking time. What brings the husband home at the stated time but the warm welcome prepared for him by his wife ? (Laughter and applause.)

DAIRY CHEMISTRY.

By Prof. R. Harcourt, O.A.C., Guelph.

The subject which has been assigned to me is not one of my own choosing, but one which your programme committee no doubt thought would be congenial to me, and wide enough, after all, to allow of a very wide choice of subjects.

The work of the chemist has been of material assistance to dairying in the past ; for it is through his efforts that we have our present knowledge of the composition and digestibility of the cattle foods used in feeding dairy stock, which, along with a chemical study of the requirements of an animal, has done so much to put cattle feeding on a scientific basis. It is through his efforts also that we know so much about the composition of the various products of the dairy, and that we are able to talk as intelligently as we do regarding the proportion of fat, casein, ash, and water in milk and its various products. But, however much the work of the chemist may have done for dairying, more remains to be done. We do know in a general way the composition of milk ; but we know comparatively little about the changes that take place in its various constituents when it is made into butter and cheese. We know that by the use of rennet we can coagulate milk, and that by following a certain line of procedure cheese can be made ; but we understand very little of what actually takes places during the process of manufacture, and the cheesemaker is compelled to go on making cheese largely by rule. It is true that intelligent observation and careful attention to practical details have made it possible to produce a fairly uniform quality of cheese ; but, after all, how much is really understood about the various changes in the process of manufacture ? Acid is developed—too much or too little are both injurious ; but we do not know how much there should be. Casein is changed, we do not know in what way ; for it is not known exactly what casein is to start with. The green cheese must be "cured" or "ripened" before it is fit for consumption. The question naturally arises, What is this curing ? We know that cured cheese is more digestible than the green article ; but regarding what these changes are ; what conditions are most suitable for the curing ; or even what causes all these wonderful changes, we know practically nothing. It does seem strange that, although cheese has been used by man as an article of food for centuries, we are still ignorant of the cause of the "breaking down" of the curd which takes place in curing. The most eminent authorities differ on this subject. Some claim that the curing is caused by the moisture in the cheese, others that it is caused by the acid developed during the process of manufacture, others that the pepsin of the rennet does the work, and still others that it is a ferment natural to the milk which causes all the changes. It is very likely that some day it will be found that it is a combination of all

these. It is evident, though, that until we know more of the chemical changes, both in the manufacturing process and in the curing, it will be impossible to thoroughly understand cheesemaking. It will thus be seen that there is a large field open for research both to the chemist and to the bacteriologist—a field that can only be covered by the chemist, the bacteriologist, and the practical man working hand in hand.

At the Ontario Agricultural College these three Departments are working together trying to reach a solution of some of the problems already mentioned. Drs. Babcock and Russell of Wisconsin, and Dr. Van Slyke of Geneva, N.Y., are also working along these lines, and it is to be hoped that before long some valuable information will be obtained which will be of assistance in controlling the making and curing of cheese.

Your President has said that what is wanted in this meeting is good practical talks that will be helpful to those that are engaged in this great industry. Let me, then, give you the results from the practical side of some work which was undertaken by the Dairy, Bacteriological and Chemical Departments of the College. The object of the work was to study the germ life, the chemical changes, and the effect on the quantity and quality of the cheese when cured at different temperatures. The plan of the experiment was as follows :

Fifteen hundred pounds of milk was made up in the usual way, and after salting the curd was evenly divided between five different hoops. On taking the cheese out of the hoops they were dated and lettered A, B, C, D, and E. A was at once placed in cold storage and kept at a temperature of 38 to 40 degrees. The other four cheese were placed in a curing room at 65 degrees. At the end of one week B was removed to cold storage, at the end of two weeks C was placed in cold storage, and at the end of three weeks D was placed along with A, B and C. The cheese marked E was allowed to remain in the room at 65 degrees. This experiment, with a few exceptions, was repeated every week from April to November, so that altogether some twenty-five lots were made. Samples were taken regularly for chemical and bacteriological analysis, weighings were made to determine the comparative shrinkage, and the cheese was judged from time to time by experts to ascertain the effect on the quality.

The chemical and basteriological results are as yet so incomplete that it would be unwise to say anything about them here. The results of the effect of the low temperature in curing on the yield and quality of the cheese, while incomplete, point so strongly in one direction that we feel safe in bringing the results before the meeting.

First, regarding the yield of cured cheese, I may say that from the weighings made, it was found that the cheese cured at a temperature of 40 degrees lost less moisture than those cured at a temperature of 65 degrees, the shrinkage being 2 per cent. more at the latter temperature than at the former. Or, in other words, there was two pounds more water retained in every 100 pounds of cheese cured at 40 degrees than there was when cured at 65 degrees. The percentage of water was determined in a number of samples of the two classes of cheese when they were from two to three months old. The average of the determinations showed that the A cheese (those kept at 40 degrees from the time they were taken from the hoop) contained 32.72 per cent. of water, and that the E cheese (those kept at 65 degrees from the time they were taken from the hoop) contained 30.72 per cent. of water. These results show that there is two per cent. more water in one than in the other, and confirm the results got by weighing the cheese.

Regarding the quality of the cheese, I may say that on the 21st of September three experts scored all the cheese made between April 26th and July 25th. When the average scores of the three judges on the five classes of cheese was obtained it was found that the highest number of marks were given to A cheese, the one which had been taken directly from the hoop and placed in cold storage at a temperature of 40 degrees. The others followed in the order in which they had been placed in cold storage, with E, the one cured entirely at a temperature of 65 degrees, last.

On November 11th some cheese four months old were sent to Montreal, where they were scored by seven experts, who also placed them in the order in which they had been placed in cold storage.

The cheese cured at a low temperature are more moist, and have a milder flavor, and appear to be nearer what the old country market is demanding at the present time.

It is worthy of note that the chemical analysis shows that the amount of casein which has become soluble increases with the longer time the cheese were kept at the higher temperature. Measuring the ripeness of the cheese by the amount of casein which has become soluble, three and a half months at 40 degrees appeared to be equal to one month at 65 degrees.

From the preliminary results, which cannot be considered as final, we may safely conclude that the prospects are favorable for curing cheese at so low a temperature as 40 degrees. It is not claimed that this is the best temperature ; but so far as this work goes, better resuls have been obtained at 40 degrees than at any higher temperature.

Dr. Babcock has got good results in curing cheese below the freezing point of water. At the present time it is impossible to say what is the best temperature at which to cure cheese. That point is still open to investigation.

The chief advantages of the low temperature curing are : Greater uniformity of product, less loss of weight in curing the cheese, improved quality of cheese, and the fact that the manufacturers of cheese are independent of hot weather conditions and unofavorable markets.

The President : Are cheese taken from the press and put at once into cold storage for curing as good generally as those cured in a good curing room for ten days or two weeks, and then sent to the cold storage curing-room ? I am of opinion that the last described method will give the best general result.

Prof. Harcourt : Our experiments have gone to show that putting the cheese directly from the press into cold storage is the best.

The President : We have found that if put into the cold storage direct from the hoop there is a tendency towards bitter flavor. We find that cheese kept for a week or two before being put into cold storage curing-rooms will have that desirable nutty flavor.

Mayor Graham (Belleville) : I have been experimenting with cheese in cold storage for eleven years. I have a factory or two and a storehouse, and I buy more or less cheese. My experience has shown me that keeping cheese for twelve days and curing at 38 degrees would develop a bitter flavor. We have found the best results with cheese taken out of the factory at about ten days, and then kept at a temperature of about 45 degrees. I have also found that there is a difference in the effects of cold storage on white and on colored cheese. White cheese can be kept at a lower temperature than colored cheese. The latter kept at 38 degrees will not retain its color like white cheese, for if kept at that temperature for five or six months much of the color is apt to go. Therefore colored cheese should be kept at a higher temperature than white.

J. A. Ruddick : I have seen a number of samples cured at 40 degrees. I heard Dr. Babcock state that the cheese he had cured at 40 degrees had a most excellent flavor when eight months old—in fact he described it as first-class. Last November I attended a meeting at Morrisburg, and saw some cheese exhibited by Mr. Wm. Eager which had been made in July and kept in a cold storage curing-room at 38 degrees. There were two cheese, one white and one colored. At that time they had been out of cold storage about eight days. The colored cheese had never been as good as the other, but so far as any other difference was concerned I could see nothing marked. There was a slight tang there that had evidently existed from the beginning. I believe that the point has not yet been determined as to what is the best temperature to produce the best quality, and it is my opinion that different cheese would require different temperatures and different treatment. The matter of moisture may have something to do with it. Now there are two sides to this question : the purely scientific side and the commercial one. The latter is to determine whether we can afford to pay the cost of keeping cheese at this low temperature, for it will cost something extra to keep cheese in cold storage rooms for four months at a temperature of, say, 40 degrees. Of course the im-

proved quality of the cheese may give a value that will much more than pay the extra outlay. I saw some cheese that Dr. Babcock cured at a temperature of 20 degrees—below the freezing point. It was then eighteen months old, and had been out of cold storage for some time, yet it was of excellent flavor. It had never been turned over in the curing room, however, and had got a little pasty on one end. Otherwise it was a fine cheese. That was a revelation to me, for I had always believed that cheese could not be kept for any length of time under the freezing point of water ; I thought that it would be destroyed. When the cheese were a few weeks in cold storage they had an appearance as if frozen, but afterwards that appearance left them, and they became smooth and nice looking. I am now of opinion that cheese can be safely made with more moisture and cured at this low temperature, and yet keep its flavor. I think I am quite within the mark in saying that the saving in shrinkage alone will pay for all the expense and time it takes to cure cheese at a lower temperature, as indicated by the methods brought before your attention to-day.

Mr. A. W. Woodward, Dairy Inspector, Department of Agriculture, Ottawa, was asked to give his opinion on curing-rooms, and said : In connection with curing-room experiments conducted under the direction of our Department, we found that the results were practically the same as those reported by Prof. Harcourt. However, we did not cure our cheese in exactly the same way as they did at Guelph. We did not compare an ordinary temperature with a low temperature, but rather compared a medium temperature with a high temperature for curing cheese. In our plan three lots of June cheese were experimented with. One was cured at 65 degrees or under ; another at 80 to 83 degrees, and one in a room where 91 degrees was at one time recorded. These cheese, after curing, were put in storage at Montreal at a temperature of 38 degrees, and held there till November. It was found that the quality of the cheese varied in exact order according to the temperature of curing, that cured at 65 degrees being the best, and that at the nineties the poorest. The commercial value of the cheese cured at 65 degrees was placed at a cent a pound above the commercial value of that cured at about 90 degrees, and half a cent a pound more than that cured at 80 to 83 degrees. There was, furthermore, a difference in shrinkage between cheese cured at 65 and 94 degrees of one pound per box in favor of the lower temperature. A good deal would also depend upon the temperature at which the cheese had been kept after making and before being put into the cold storage quarters. As I have said, our results have been very similar to those described by Prof. Harcourt, although our experiments were not carried so far as those at Guelph were.

The President : A factory making, say, 2,000 boxes of cheese would pay for this extra cold storage equipment in one year. The man who is not prepared to fit up his factory so as to meet this new requirement of the business should get out of the trade.

Mr. Gallagher : At what time of the year were these cheese made at Guelph ?

Prof. Harcourt : In the early part of the season, running from July to August. We have the cheese for the rest of the season until November in cold storage yet.

Mr. Gallagher : Then the plan is best for hot-weather cheese ?

Prof. Harcourt : Yes; although we find that cheese made in April and July are very similar in quality when taken out of cold storage. Some of the cheese that went off at 65 degrees never developed when placed in cold storage at 40 degrees—that is, the same make of cheese. We have noticed in our work no bitter flavor like that complained of by Mayor Graham. We do not say that every cheese kept at 40 degrees will give the best results ; but we have found that such cheese gave us the best results. There was only a slight difference between the cheese placed in cold storage immediately and those put in there within a week. Had these cheese been first kept at 80 degrees for any length of time before being put in cold storage I would expect to see a considerable difference in their quality.

A Member : Should each cheese factory have a cold storage room ?

Prof. Harcourt : No. The cheese could be sent to a central place. The keeping of them for a few days would not make much difference.

The President: If I was a patron I would force the maker to put his curing-room in the best possible condition. The patrons, after all, are the men who must settle the matter. You must have the best curing-room available or you will fall behind in the contest. With properly constructed curing-rooms most of the poor cheese would soon disappear.

CREAMERY LEAKS.

By J. W. Hart, Superintendent Eastern Dairy School, Kingston.

Those gigantic industrial combinations of the United States, commonly called trusts, while they are monopolistic, and hence dangerous to the public interests, possess features that are worthy of imitation in so far as they aim to reduce wastes and to cheapen manufacturing processes. If the dairy business could be organized into a great monopoly under efficient management, a great many of the petty leaks that make up such an expensive aggregate could be stopped, but it is doubtful if the producer or the consumer would benefit by the change. In order to be effective a trust must kill off competition, after which it will proceed to collect the funeral expenses from its customers. Under free competition, for a variety of reasons, there is not the same incentive to reduce wastes and cheapen manufacturing methods. Like the rain from heaven, these losses fall alike upon the just and the unjust, and except in isolated instances they are not noticed, or are considered the legitimate outcome of the business. Certain it is that a large amount of hard-earned money is being wasted in the dairy business. The preventable losses are probably greater in the creamery business than in cheese manufacturing, because the making of cheese in the factories has been carried on for such a length of time, and competition between neighboring factories is so keen. Self-preservation has made it necessary to reduce the wastes.

Directly as we are able to lower the cost of manufacturing the finest quality of butter, and our patrons begin to realize (for they are only beginning to realize) the high feeding and manurial value of skim milk, we hasten the time that our butter export trade will stand in the same proud position as our cheese trade to the mutual advantage of both. Again, as compared with the methods of our competitors in the world's dairy markets our ways are often wasteful and extravagant, and we must mend them if we are still to continue to march in the van guard of the procession. It is in the small manufacturing establishment with unsuitable buildings, poor equipment, and employing cheap and inefficient labor, that we find the largest proportional wastes. In not a few creameries and cheese factories, the best way to stop the leaks would be to close up the buildings and to transfer their patronage to their neighbors. Some buildings are in such an unsanitary condition that they are utterly unfit to make butter and cheese in, and nothing but fire will purify them. (I hope that this remark will not be construed as inciting to incendiarism).

The cause of creamery leaks may be set down primarily to false ideas of economy and to incompetence and inexperience on the part of the management. Patrons fail to realize the extent of the unnoticed losses, but all the same they are important, and amount to such a large total that were the truth known it would not be believed by many that such a state of affairs could be possible. The proprietor of a creamery hesitates to put in machinery that would enable him to make better butter at less cost. It might be taken as an indication of prosperity, and he would be invited to cut down his already low charge for manufacturing. If he should hesitate to do so, he would probably find that a rival concern would be started in the same neighborhood, and two creameries crippled for lack of milk would have to be maintained at a loss, where one might handle the milk with economy and profit to all. In co-operative creameries (so called) leaks and wastes may be more serious because it is nobody's particular business to look after them. If the butter-maker is ignorant, careless and lazy, he will most assuredly be a much more expensive man than an intelligent, careful and energetic

butter-maker whose abilities probably command double the wages. Perhaps the greatest leak in creameries is inefficient skimming, through using inferior separators, or on account of one or more of the following :—Over-feeding the separator, separating at too low temperatures, the bowl not running steadily, or at too low speed. A separator that will skim 3,000 lbs. of milk in the spring, should have its capacity cut down to 2,500 in the fall to do equally clean skimming where the speed and temperature remain the same. The skim milk should be tested daily, and the information gained by testing the skimmilk should be used in regulating the various factors that go to make clean skimming. With a good separator intelligently run the loss of fat in the skim milk, as compared with the loss in running a fairly good machine by a somewhat careless operator, might amount to one-tenth of one per cent. If the creamery received 8,000 lbs. of milk a day the loss of butter fat in a year would amount to 2,400 lbs., which, at 20 cents a lb., would be valued at $480. This is by no means an extreme case, and it is likely that the loss of fat in skimming would have to be considerably greater before the patrons commence to comment upon it.

In churning, wastes occur through imperfect ripening of the cream, churning at improper temperatures and through foul and leaky churns. Another frequent source of loss is the energy wastes in badly designed and poor constructed buildings. The buildings and machinery should be arranged with a view to economize labor. Wooden floors, on account of frequent renewals and the difficulty in keeping clean, are too expensive for creameries. Cement floors are superior in every way. A wooden floor, no matter how well built, will settle under the presssure of a vat of milk and throw the separator out of level, resulting in unsteady motion, imperfect skimming and increased wear on the machine. Many expensive separators have been consigned to the scrap-pile because they were not set upon a good solid foundation and properly taken care of. If a machine is not being used for a time, all the bright parts should be covered with hot tallow or cheap vaseline. If a turbine, the step bearing should be taken out, wiped dry, oiled and replaced.

Refrigerators are often too large and not well built, causing the waste of large quantities of ice. Damp, moldy refrigerators are a common source of loss. In covering ice in the icehouse, wet sawdust, or an insufficient quantity is often used, resulting in rapid melting of the ice. Improper lining of shafting, light shafting or too few hangers cause increase in friction and loss of power. The same results follow where the belts are not run at the proper tensions. The over-loading of machinery results in increased wear and tear, if nothing more serious happens. Sufficient oil, and no more than will keep the bearings properly lubricated, should be used. The experienced creamery man should have his ear so attuned to the ordinary noise of the machinery that he will quickly detect any unusual sound, so that he may find out the cause in time to prevent an expensive and annoying breakdown. Very frequently machinery is in use that absorbs a great deal of power in doing little work, as where an engine, shafting and pump have to be run to elevate skim milk from the separator. Leaking unions and valves waste steam, and should be attended to. Common valves, that cannot be kept tight, should not be used where high pressure steam is carried.

The boxes and bearings of the engine should be kept carefully adjusted and lubricated, and the slide valve should be set to cut off at the proper place in the stroke. For heating it is often possible to use exhaust steam, which will effect a considerable saving. In using exhaust steam a back pressure valve should be placed on the direct exhaust pipe of the engine. Besides the indirect waste of fuel that has been indicated, there are more direct wastes on account of boilers not being properly bricked in, and by having boilers improperly set ; by allowing them to get scaly and dirty, also through priming.

Some of the more direct wastes in fuel will now be considered. The return flue tubular boiler is a more economical steam producer than the upright or locomotive type of boiler. Furnace and flue doors should shut tight, so that no air will be admitted except what is drawn in under and through the grate bars, except that where fresh coal is added to a fire it will be an advantage to admit a little air above the fire in order to

ignite the generated gases. Some time should be taken to get up steam in order to prevent waste of fuel and to allow the metal to expand gradually and equally. All sudden expansions and contractions of the boiler, or any portion of it, weakens it and shortens its life. The water level in the boiler should be kept as near stationary as possible, and the water should never be allowed to fall below the tops of the flues; leaking flues usually and serious explosions sometimes result from neglect of this practice.

A ton of good hard or soft coal will produce as much steam as one cord of hard together with one cord of soft wood. Although wood is still largely used in our factories and creameries in the older settled portions of the Province, it is becoming too expensive to use for steam production. To use green or wet wood is extremely wasteful, as the contained water has to be converted into steam, requiring a large excess of fuel. To argue that green wood is the more economical shows that something is lacking, perhaps the furnace is in such a dilapidated condition that it is impossible to control the fire. For burning coal the furnace should be smaller and the grate bars heavier and closer together than for wood.

At the Kingston Dairy School egg coal used to be the principal fuel, although some wood had to be used at times when a heavy demand for steam was made upon the boiler. By putting in herring-bone grate bars which were raised about a foot higher than the old bars in the wood-burning furnace, we are now able to get more heat out of a mixture of hard and soft coal screenings in equal proportions. As the best hard coal costs $6.25 delivered, and good wood $5.00 a cord, we are saving about 50 per cent. in our fuel bill by burning this mixture, which costs us $3.00 a ton.

The principal heat-producing constituents of fuel are carbon and hydrogen. In burning, the oxygen of the air combines with these elements, resulting in heat. Carbon unites with oxygen in two different proportions. When improperly burned carbon monoxide, a colorless gas, is formed. One pound of carbon, together with the necessary oxygen to form carbon monoxide, will evaporate 4½ lbs. of water at a temperature of 212 degrees. Completely burned or converted into carbon dioxide one lb. of carbon will supply over three times as much heat, or sufficient to evaporate 15 lbs. of water at boiling point. Hence the necessity of a sufficient supply of air to the fire. Hydrogen has a much greater calorific value than carbon when burned. When burned with oxygen to produce water, one lb. of hydrogen is sufficient to evaporate 64 lbs. of water at 212 degrees.

In smoking meats the fuel is partially distilled, and smoke and various gases are given off unburnt. In a similar manner fuel may be wasted by bad firing. The dense volumes of smoke which pour out of smoke stacks indicate great waste. Soot and smoke are nearly pure carbon expelled by the hot gases from the furnace, and show a lack of skill in firing. To admit more air than necessary for perfect combustion is also wasteful on account of the cold volume of air reducing the temperature and adding bulk to the gaseous products of combustion. To assist in the conduction of heat from the fire to the water in the boiler, the bottom of the boiler and the flues inside and out should be kept clean. If a deposit accumulates in the bottom of the boiler it will act as a non-conductor, and the metal will be burned out or blistered. Using steam at a low pressure is another wasteful practice. Sufficient heat is absorbed in changing one lb. of water at 212 degrees into steam of the same temperature as would heat 966 lbs. of water one degree Fahrenheit. This is termed the latent heat of steam, and where the steam pressure is low much of the fuel burned is used in converting water into steam instead of increasing the efficiency of the steam already generated. Covering steam pipes to prevent radiation should be more generally practised, especially where the steam has to be carried long distances.

While the list of creamery leaks has not been by any means exhausted, no mention having been made of such obvious losses as those taking place through leaky faucets and vats, or the reductions in the feeding value of the by-products on account of dirty skim milk tanks, through holding goods for higher prices, the occasional dishonesty or failure of buyers, the injurious effects of high temperatures upon the quality of the goods, and many others more or less serious, enough has been said to show

the nature and extent of the losses, and that they are almost entirely preventible. But it is only by eternal vigilance that this can be done. First-class machinery should be put in and a first-class buttermaker should be hired to run it. The all-important point is for creamery patrons or proprietors to get a competent and conscientious buttermaker if any reasonable inducement will attract him. He must be a man who is making a study of the many problems connected with dairy matters, who by attending conventions, taking part in the discussions, keeping his patrons interested in and informed upon dairy topics, and by subscribing to one or more dairy papers, evinces his interest in his work. He must be a close and critical observer, and his judgment should be ripe and keen enough, so that he will draw correct conclusions from what he sees. All these things he may do and be and still fall far short of the mark. To his knowledge he must add zeal, and must carry that energy and enthusiasm into his daily work that will enoble it and make it characteristic of the man, honest and thorough and as near perfection as human brain and hands can make it. When such a man is found, it is the very acme of folly not to hire him for a few paltry dollars saved in wages, when many times the difference will be lost if an incompetent man be employed. Thoroughness is the keynote, and with thorough instruction in the best methods, followed by thoroughly honest, conscientious work in the creamery, success is sure.

Mr. Sprung : Do you use a starter ?

Mr. Hart : Yes ; we pasteurize the cream. We like to use plenty of starter when separating very rich cream. We use 10 to 15 per cent. of starter. We get the bacteriologist to furnish us with a pure culture or starter, although occasionally we use Hansen's pure lactic ferment. We select the best milk that we can get in using a starter, taking about four pounds of it, and if it turns out well we perpetuate it, just as a baker does good yeast. We sometimes find considerable trouble in getting just the flavor we want; but once secured we are careful to keep it as long as possible. This starter is for cheesemaking. In buttermaking we take buttermilk made from pasteurized milk, and we run it up to a temperature of 160 to 180 degrees. If it goes off flavor we use the pure lactic acid that I spoke of. Sometimes we use the hand separator for getting a starter. If you get your starter over-ripe it will coagulate. We find, however, that buttermilk used as a starter will not hold the flavor for more than two or three weeks, and therefore we change about every couple of weeks. If I were running an independent concern, and had to depend upon my own resources, I would make my own starters. We find, also, that we can separate more readily at 160 degrees than at a lower temperature. We have tried all the way from 60, 70, 80, 90 and 100 degrees, and increased to 170 and 180 degrees, and have found that the efficiency increases with the temperature up to about 160, or even 170. The milk runs through faster.

A Member : We find that pasteurized milk does not give as rich a flavor to butter as the unpasteurized milk does.

Mr. Hart : That may be, but you can get rid of the more undesirable flavors.

Mr. Green : The milk dealers at Toronto desire unpasteurized cream rather than pasteurized cream. They want the very best care taken of it.

A Member : What about November milk ?

Mr. Hart : We got milk of good flavor in November. There was plenty of grass then.

Mr. Gallagher : How high would you go in temperature when using a separator ?

Mr. Hart : If you run it above 190 degrees the steam will run through the pasteurizer and blow it out. I would not advise going any higher, or even as high as that We run the cream directly over a cooler, and cool it down to churning temperature as sooon as possible. We used to cool it down to a temperature of 40 or 50 degrees, but now we cool down to only 70 or 75 degrees, and run it through at once. We do not need to watch it all night, like a sick baby. I like quick ripening. I prefer 65 degrees, and cooling it.

Mr. Green : Why not use more starter, and ripen at a lower temperature ?

Mr. Hart : We churn at a lower temperature, and have the advantage of clean churning, and we have no loss of fat. We churn at 52 or 54 degrees, with about 35 per

cent. of cream. We find the body of the butter just as good. We have the facilities for cooling. It must be cooled for several hours. However, if you leave it to cool over night it will ripen, and you will not get such good results. Always cool it at once.

Mr. Green : How long does it take cream to ripen ?

Mr. Hart : About eight hours in our case. I might have reason to modify that if I was situated like a great many creameries are. We do not chill it below churning temperature.

A Member : What is the average temperature of cows' milk ?

Mr. Hart : That would depend. About 100 to 115 degrees.

A Member : How about running the separator fast or slow ?

Mr. Hart : I have found that when running the separator at a great speed considerable cream will flow over in a sort of fine spray; it will even get upon the window panes. It is a sort of condensed cream. Of course it is not a large amount. We finish the cooling process at once when it leaves the separator, by running it right over the cooler.

Mr. Sleightholm : Why do a large number of creamerymen pasteurize the cream instead of the milk ?

Mr. Hart : We do not pasteurize the cream. We think that if there is any injurious bacteria in the milk the sooner it is dealt with the better. We have to elevate the milk whether or no, and so it means but little extra trouble to pasteurize the milk.

Hon. Sydney Fisher, Dominion Miniser of Agriculture, after expressing his great satisfaction at being present, the hon. gentleman proceeded to say: I have been at many of your gatherings in various parts of the ountry, and I do not think I have ever seen so large and appreciative an audience on the first day of the Convention. I understand that the section surrounding Whitby is not so largely a dairy district as are other parts of the Province, yet I think the local interest in dairying will develop after this gathering, and there are many here who have come to learn all they can about this great industry. I wish to lay before you some reflections which have come to me regarding the dairy business of this country; more especially some points regarding the handling of the products of our cheese factories and creameries. One or two things have come up at this convention which are well worth our greatest consideration. Prof. Harcourt has given us the results of a most interesting and valuable series of experiments in curing cheese at the low temperature of 40 degrees, as compared with higher temperatures. Mr. Woodward has given us results of experiments in curing cheese at high temperatures—from 60 degrees and upwards. The former seem to me to be more an investigation for the future to a certain extent. The Guelph College experiments, while most valuable, could be applied only where cold storage equipment was in vogue; but those experiments described by Mr. Woodward deal with conditions at present confronting us. Your President was right when he said that it was practically throwing away money to make cheese in a factory where the temperature could not be kept to at least 65 degrees. The cheese trade of Canada to-day is in a critical condition, and something has to be done immediately by the people who are engaged in the dairy business if we are to retain the proud position we have so long occupied in the British markets in connection with our cheese. Therefore, I would ask all those who have control in cheese factories to see that immediately—within the next season—their curing-rooms are so equipped that they can keep the temperature at about 60 degrees—certainly not above 65 degrees. Mr. Hart has been describing certain little leaks in the dairy industry. These are due in many cases to the carelessness of the workers, and often to the carelessness of those who control the business. Owners of factories should not permit these leaks to go on. Care requires to be exercised by the man whose money is put into the business. Mr. Hart also drew a picture of the ideal maker, the man who in any place in Canada would be worth from $1,000 to $2,000 in any industry. (Applause.) How much are your makers getting ? I understand from $300 to $500 a year. How, then, can you expect to get such men as have been referred to when any other industry will commend their brains and energy and skill at a higher rate of wages? Mr. Hart has also shown that the waste alone would pay the extra wages of the men, and put money into the

pockets of owners of the factories and creameries as well. Our creamery system must move in the direction of larger factories, which can better afford to pay for such ideal men, as those described to-day—men who will know how to stop these wasteful leaks. It is always inspiring to me, as Minister in charge of the Department of Agriculture, to come to such a gathering of dairymen as this is. What I see and hear while with you helps me very much in the great work that has been placed under my charge. (Applause.)

CREAMERY AND CHEESE FACTORY BUILDINGS.

By J. A. Ruddick, Chief of Dairy Division, Ottawa.

It must be admitted by everyone who knows the dairy business at large that a great many buildings in which butter and cheese are being made are more or less of a makeshift character, and it seems to me that the time has now arrived when a greater measure of permanency, as well as of efficiency, should be given to the buildings in which our dairy products are made. It was so a few years ago with farm buildings, but we all know that within the past ten years there has been a very great improvement in the direction of durability and suitability, and the owners of these better buildings are finding it to be an advantage from an economic as well as from other standpoints.

The matter of drainage and water supply should be given more attention when sites are being selected for cheese factories and creameries. Sites for these buildings have been chosen too often without proper consideration of these two most important points. In the older countries they pay more attention to these matters. In Denmark especially, the buildings are put up with a view to permanence and also to sanitary conditions, and they pay a great deal of attention to the question of drainage. The laws of Denmark compel every factory to have a closed tile drain to carry the drainage to a sufficient distance from the creamery or cheese factory, to avoid risk of injury to the product. I know cheese factories in Canada where there is always danger of contamination owing to defective drainage.

We do not pay sufficient attention to the surroundings of our cheese and butter factories. There is generally a lack of attractiveness about these places, although we sometimes find a man who takes a pride in making his factory surroundings look neat and inviting. I have seen a lawn, with some flowers or shrubs, or a few flowers in the windows; but too often there is absolute carelessness and indifference regarding such matters. Neat and attractive surroundings have the effect of giving an improved tone to the whole neighborhood; it seems to have an unconscious effect for good upon those who supply the milk, and to inspire them to send it in better condition. It seems to me that the farmers of any district should look upon the cheese factory or creamery as a part of their farm equipment, and they should take as much pride in having that factory well built and looking well as they would about any portion of their own place.

The matter of putting in a concrete or cement floor is a question that should be considered by every creamery and cheese factory owner in Canada. Mr. Hart has already shown you the advantage of these floors. For a long time I was prejudiced against this class of flooring for dairy buildings. I had seen some which were failures, and had come to the conclusion that it was an impossible thing to construct a cement floor that would remain in good condition. However, I went to New Zealand a few years ago, and I found there that every cheese factory and creamery had cement or concrete floors. They had to use such material there, as their wood decays rapidly, and costs a great deal. The men who make the floors have had a lot of experience, and the work is now done very well. These floors are very much like the concrete sidewalks of this town, and are very permanent. A cement floor must be well constructed, or it will be a very poor floor indeed; it will crack soon, the surface will wear off, and it will go to pieces generally if not laid down with skill. Of course wooden floors are nicer to work upon, but from the standpoint of durability and sanitation the cement floor is much ahead of the

wooden floor; it will last a lifetime if properly built, while a wooden floor will only last about five or six years. It is impossible to have proper drainage with wooden floors. on account of moisture dropping through and soaking the ground below.

The cost of a cement floor would be about ten cents a square foot, which for a building 75 x 30 would amount to $225, while a wooden floor for the same area would cost about $150. In the case of the cement floor you have one that is permanent, while in the case of the wooden floor it would have to be renewed in five or six years.

It has been brought out very clearly to-day that we should give more attention to the construction of our curing-rooms, and that we need rooms that will have more or less of the nature of cold storage buildings. It is important that the temperature should not go higher than 60 or 65 degrees.

I think there has been too much value given to what is called the "dead air" space in insulation. As a matter of fact, it is impossible to get a true "dead air" space. If the space is over half an inch in width better results will be obtained if such space be filled in with some non-conducting material. Refrigerating engineers have found that out. Of course if air could be kept perfectly still it would be the most non-conducting part of the wall; but it has been shown by the best authorities that if the space is more than half an inch wide there will be a movement; the heat will be carried by convection and not by conduction. One of the best materials for filling spaces in walls for insulating purposes is what is called mill shavings. Sawdust is not nearly so good, being more liable to get musty. Experiments by cold storage engineers have shown that for wall construction eight inches of mill shavings, with two ply of lumber and one ply of paper on each side is equal to eight boards, four ply of paper, and three dead air spaces. By having double boards on the outside, with paper between, and one board and paper in the inside, we have a very good construction for a cheese factory curing-room, and it would not be expensive. Then this filling of shavings should be carried over the ceiling and down both sides without any break, and even under the floor. The paper used in such construction should be of the waterproof kind, to prevent dampness getting into the wall and thus destroying its insulating properties.

I have spoken of the cement floor for the curing-room. I am assuming that we are to keep the curing-room at a temperature of 60 to 65 degrees. A cement floor is a good conductor of heat, and as it rests upon the ground it will carry off the heat very rapidly, transferring it to the earth below. The temperature of a cement floor will always be near that of the earth itself, and will not go much above 60 degrees at any time of the year. A room with a cement floor can be kept at a low temperature a good deal more easily than one with a wooden floor.

Then there is the matter of doors and windows. These should be close fitting. Otherwise it is a good deal like building a water tank with openings at some point through which the water leaks. The object of such a building is to keep the heat out. Of course it would be impossible to construct a building which will altogether prevent heat from coming in, but an improvement can be made in the matter of windows and doors, for too many curing-rooms have badly fitted windows and doors through which the heat enters rapidly. Standing beside one of these windows in cold weather you soon feel the cold air coming in, and if cold will enter during winter, you can depend upon it, the heat will come in during the hot weather. I would advise having windows with solid sash, and would provide for ventilation in some other way. Have double doors fitted as closely as possible. The same thing is true of the creamery, only that it will pay in that case to put in more insulation.

A weak point in many creamery refrigerating-rooms is that the floor is not water-tight. Water will find its way through the floor, soaking the insulating material, and thus the power of insulation is more or less lost.

A cement floor, while of great value in a cheese curing-room where the desired temperature is very near to that of the floor upon the ground, is not at all suitable for a creamery refrigerator, where a much lower temperature is required. That quality of high thermal conductivity which makes it useful in the curing-room condemns it for the refrigerator.

The best floor that I have ever seen used for such a purpose is constructed something like the deck of a ship. Two-inch plank are slightly beveled on the edges, so that when laid the upper side of the joint presents an opening about one-quarter of an inch wide. This space is tightly caulked with oakum, leaving half an inch or so to be filled with hot pitch (not tar).

This Whitby section is not yet known as one of the dairy districts of the Province, but there is no reason why it should not be one in the near future. You will be able to benefit by the experience of those in the older dairy districts. You will not have to repeat their mistakes, but you may repeat their successes. It is true that in the manufacture of butter and cheese profits are cut pretty close, but there is a fair margin if proper buildings are erected, fitted with good machinery, and employing men who are properly trained. In various parts of the country we have such conditions already existing —good buildings, good equipment, and good makers and managers. Remember that in this dairy industry it is a matter of economy to make things permanent.

Mr. Sprung: Would you not prefer brick walls to cement walls for foundation?

Mr. Ruddick: a brick wall does not of itself afford very good insulation. The heat will pass through it. Yet a brick wall might be so constructed as to be satisfactory.

Mr. Sprung: I have brick walls to my building, and the temperature has never gone above 72 degrees.

WELCOME BY THE MAYOR.

At the evening session on Wednesday the Opera House was packed, half of those present being ladies. An orchestra rendered popular selections from time to time, and local vocalists gave solos.

Mayor Ross gave a hearty welcome to the members of the Association. He considered it one of the most important gatherings that had ever taken place in that town.

The President made a reply in his most genial manner, which was loudly applauded.

Wm. Ross, M.P., made a short address. He congratulated the members of the Association upon the success of the Convention, and declared that he had been so interested in the proceedings so far that he had decided to remain for all the sessions. In fact, he had become a member of the body. (Applause.) In travelling through a portion of Eastern Ontario, more especially in the Perth district, he had noticed that a great deal of the country was given over to pasturing and dairying. Where there was dairying there was more or less of prosperity. He hoped that the practice of dairying would spread to the County of Ontario. The Eastern Dairymen's Association was doing a good work in disseminating valuable dairy information, and in instructing those engaged in the making of cheese and butter.

W. H. Hoyle, M.P.P., also welcomed the Convention to Ontario County in a brief but very witty speech. He considered dairying one of the most important industries in the Dominion. A reference by the speaker to the apparent falling off in the imports of Canadian butter into the markets, as given from British sources, drew out the explanation from the President and the Hon. Mr. Fisher that the British authorities credited the consignment to the port of shipment, and that where the Canadian butter was shipped from American ports, the United States, and not Canada, was given the credit. A resolution regarding this matter was introduced later on.

A WELCOME AND A MESSAGE.

By Hon. John Dryden, Minister of Agriculture, Toronto.

I ask permission to join with Mayor Ross in extending to you and to your workers in connection with this Association a most hearty welcome to the town of Whitby, which is, as you know, the capital of the rich and famous County of Ontario. I do not wish that my words should be merely personal, for in this respect I represent the Government of Ontario which is delighted to know that you are willing to come so near the capital, and especially at the time when the Legislature is in session. Several of the members of the Legislature are here to-night. and others may drop in upon you. Your presence so near indicates that you are not afraid of the criticism of those who annually vote the supplies that keep up this Association.

This is the first time you have left your place of wisdom, may I say, in the east, among the dairymen of that part of the Province, and tarried so near to the western limit of your territory. You have not many supporters in this district, for it has not in the past been a dairying county. Therefore, we understand that you come among us as missionaries, declaring the gospel of dairying, not merely as a mortgage lifter (though it has lifted many a mortgage in the east and also in the west), but because of the pure products for which your Association stands; it is a source of blessing to all. For the reason that our people have not devoted themselves to dairying in the past, we are not ashamed or afraid to say that we need the information this Association can give. We need the stimulus and enthusiasm which always follow in the wake of the annual meetings that have been held in the past.

I want specially to congratulate you, and with you the people of this town, on the great success of the meetings so far, and on the splendid audience which greets us all here to-night. You remember, Mr. President, what I promised when urging you to come to this district. I promised that you should have the choice of several good hotels at which to rest; I promised that you should have a splendid hall, well seated, well heated, lighted and ventilated, for your meeting; and I also promised that you would have good audiences. I am glad to know that every promise given has been fulfilled, and I am sure the President will be willing to say that he is now glad that Whitby was selected.

One cannot but notice that you have in the audience to-night two distinct classes; first, those who have been or may be producers; and, second, those who because of their peculiar circumstances must always be consumers of the products presented by the first class. But I wish to impress upon you that both classes are interested in the same result. The first class desires to obtain the greatest amount of money for the product they present for sale ; the second class desires to obtain the greatest value possible for the money they pay. In either case, the desire can only be reached by the presentation of a superior product. In that way only can the consumers get good value for their money, and in that way only can the producer receive the greatest amount; so that the interests of both are identical. Because of this interest. the residents of the town are here in large numbers to manifest by their presence their interest in the work you have in hand, and to give added strength and enthusiasm to your gatherings. Looking into the future of our country, it strikes me that it is a good omen to find the inhabitants of town and country willing thus to intermingle in a gathering of this kind, and to unite their influence in making the work in hand a success. I think I may say that the time has gone by in this country when men of brains and talent and education are to be found only among certain classes, and these classes always finding their habitation in a town or city. And I hope public opinion will bear me out in saying that the time has come when no honest work is considered to be menial or degrading, and when intelligence and skill will be praised and commended, just the same when it is seen in a pound of superior butter or a package of the choicest cheese as it is when it is seen in

the teaching of a class in Euclid in your Collegiate Institute or in delivering an eloquent sermon in one of your pulpits on Sunday. If either of these things be done well, it must be because in both cases much intelligence, much thought and much labor have been given to it. There is no room for improper discrimination. Each of these is a necessary part of the whole unit, and each is performing a most important work; and, therefore, I plead for the recognition in each of the same intelligence, skill and industry when it is manifested.

This is the age of industrial enlargement and enterprise. Never before in the history of the country have we witnessed such a development as is taking place to-day. It is not seen merely in the frontier towns and cities, but it has extended away into the northern parts of our Province. Places where a few years ago we found nothing but a wilderness are now converted into villages, towns and even cities; and in this respect we believe we have only commenced. One thing brings another, and we shall expect this industrial development to continue. It is found now that the highest attainments in education are brought to bear in conducting the practical business of these concerns. In my early days I was wont to think that the only object there could be in mastering certain subjects was that the person who did so might be competent to teach ohers, and that such subjects were of no practical utility. It may be I was mistaken in thus thinking; but it is perfectly certain now that we find the educated chemist, the successful students in geology, bacteriology, and other kindred subjects, are sought for, and brought into requisition, in carrying on the work of the most prominent business concerns of the country. They are not only brought into requisition, but they are paid large salaries, and the heads of these business concerns do not seem to think they could reach the prosperity they desire without them. The new milk company in the city of Toronto; the Wm. Davies Packing Company, Mr. Clergue in connection with his enterprises at the Soo, and many others, all employ these talented scientists. The rule of thumb, guess, and chance is gone. These men require accuracy, definiteness and certainty in their productions. The same thing must be true in the dairy industry, represented by this Association; educational equipment is demanded in connection with every branch, and the education which is being given is turned to the practical uses I have suggested.

I should like to say just here that we must not despise the man who succeeds today in his business, even without the advantages of schools and colleges, which some of us have enjoyed. He has acquired a practical education by his own observation and by his own experience. It may be he would have been immensely better off if he had had the advantages of an education ; but I could take you to a man in this county who never learned to read or write, and yet has become a splendid manager on his own farm, and is acknowledged to be one of the best farmers. Because he has done this, I would not despise him, even though he be not educated. Only a few days ago I was reading of two farmers living near each other, one an educated man, and the other uneducated. But the educated man was not as prosperous as his neighbor. He believed in the education of his family, which was certainly right, and they were sent to school and college. On one occasion, one of the boys having returned home, and during his absence having learned something more of the live stock industry than he had previously known, was more interested in what he saw at home and on the farms of the neighbors. He noticed how superior the herd of swine on the neighbor's farm was to that on his father's farm. He went over to inquire for the reason. He found his neighbor mixing the feed. He asked him questions, but he did not seem to acquire much information, for the same feed was given to the swine on his father's farm. Hence, he asked another question: "Is there anything more than what you have told me?" The old man quietly said: "Yes, there is something else; I always try to mix in a little brains with the feed; but you know that is a scarce article over at your farm." Here was the crucial point. The educated man had not learned to make practical use of his education, and hence he did not succeed as well as his neighbor who was practical, but uneducated, so that when it came to feeding swine the uneducated man would rank as a professor as against the other.

In this country, as well as in others, we are more and more tending towards technical education. This means an education that can be put to the practical uses of life; and the children are being turned away somewhat from the books they study to the things that are about them on every hand. The results we have achieved in past years are not sufficient; it is desired to move forward in every line of industry, and this practical education will be of much assistance in this direction. Every year we are facing new difficulties and new problems. The experience of the past does not reach them, and we must therefore resort to scientific investigation. It is not so very long ago that within the precincts of this Association great trouble was found in the fact that in some of the factories where good cheese had been produced in former years, it could no longer be accomplished. It was called "rusty" cheese. Streaks of a reddish brown color were found running through it. Men of experience made guesses, suggested improvements, and changes were tried, but nothing seemed to affect the case, and it was not until a scientist from Queen's University, Dr. Connell, was given the problem to solve that the difficulty was discovered. He found the ugly germ which caused the trouble; he found its home, its breeding ground. He was able, having secured the germ, to produce the rusty cheese. He suggested the remedy, which was to remove the pipes and troughs leading to the vats and in their places to put new ones, which would be perfectly clean, and to renovate the factory generally. After this was done the difficulty disappeared. So that really the cause was a lack of cleanliness, but there did not seem to be any lack so far as the owner of the factory was able to discover.

This year another trouble has visited us. In some of the factories in the County of Oxford—factories that produced superior cheese in the past—they could produce only a sample that was declared by buyers to be entirely "off flavor," and the milk was sometimes of a bitter taste. The result was that a large reduction in price was demanded Experienced men could not discover the cause. Professor Harrison, of the Bacteriological Department of our College, was given the task of unravelling the mystery. Although I have not yet seen his report, I am told he has discovered the cause, and that he will be able to explain both the difficulty and the remedy.

I have only to say that these professors who make a study of these things must be in the public interest at your service, and I am glad to say that I have secured for the present season added help in both the chemical and biological departments, and that part of the time at least of one man will be given to similar work in the future.

In closing, I desire to congratulate you on the dairying output of the past year. To have scattered among the community nearly thirty millions of dollars is no small item of added wealth to our country, and while it is a fact that the cheese industry has decreased somewhat, we are all delighted to know that the butter industry has almost equally increased, so that on the whole, it is a subject of congratulation. May I say that all our people—because the distribution is made through those who dwell upon the land—have received their share of this added wealth. I hope that the coming season will see the production of better goods, and that you will have steady prices. If so, then I may be permitted to say that the dairy industry will contribute its share towards making the year 1902 what you have all been wishing it might be—a happy and prosperous New Year. (Applause.)

THE CANADIAN DAIRY INDUSTRY.

By Hon. Sydney Fisher, Dominion Minister of Agriculture, Ottawa.

After a few introductory remarks, in which he complimented the people of Whitby and vicinity for the manner in which they had turned out to the meetings of the Convention, the speaker said: One of the most encouraging features of agricultural progress in Canada during the last few years is the great strides made in dairying. The status of this branch of farming has risen to a higher plane than ever in the history of Canada. The work of men like Hon. John Dryden, Prof. Robertson, President James Mills, Mr.

Hodson, and the men belonging to the Live Stock and Dairy Associations has helped to make the name of Canadian agriculture honored abroad as well as at home. Our dairy industry has been making extraordinary progress within the last few years; so much so that it has attained easily to the first position so far as the material progress of the country is concerned. Our agricultural products now stand at the head of the list of our exports; in fact, about half of the value of our exports come from the farm. In the dairy industry especially has the increase been enormous during the past few years, particularly in the amount exported. In the year 1896 we sent to Great Britain only $12,000,000 of cheese; but in 1900 it had reached $17,000,000, although in 1901 it had fallen to $13,000,000. Even this last amount is something to be proud of. Our butter industry, however, has shown a more enviable record. In 1896 we sent $1,890,000 worth of butter to Great Britain, while last year we sent over $6,000,000. (Applause.) In the English table of imports all articles and values are credited to the country from whose port they last came. As many of our exports go by way of the United States, that country gets the credit instead of us of such shipments. The difference between the amount of butter credited to us for the last year by the British tables of import and the amount actually exported from this country to Great Britain is the difference between $3,100,000 and $6,000,000, or, say, $2,300,000 in our favor. (Applause.)

However, I have now to speak a few words regarding a phase of the work that is not satisfactory. While we have made a great advance in our exports of butter to Great Britain, we have dropped off about $4,000,000 in our export of cheese. In other words, there has been a net decrease in the dairy exports of Canada for the year. Of that $4,000,000 decrease in the export of cheese about half was due to decrease in quantity, and about half to decrease in quality and price. Our butter is now generally acknowledged to be among the best brought into the British market, and while it has been gaining steadily in reputation during the last few years, our cheese is not holding its own either in bulk or in reputation. Now, we have to face this question ; we cannot put it aside. If we ignore it we will find that the proud position we have held for years of having sent about 60 per cent. of the entire import of British cheese will be lost.

What has been the course of this great cheese trade ? Thirty years ago we exported hardly any cheese. Most of our cheese were then made in private dairies. Since that time the co-operative factory system has been generally adopted, and we are now sending great quantities of cheese abroad, more especially to England. This system permitted the milk of many farms to be brought to one central factory and be handled by a skilled operator. It was not long before Canada had the reputation of making the best cheese on the continent of America, and eventually we nearly monopolized the cheese imports of Great Britain. We conquered that position, but I must be frank now and tell you that we are in danger of losing it to-day unless we make an earnest effort to retrieve our place. And how shall we reconquer that position ? Our cheese has always commanded a fair price in the British markets, compared with competitors generally, but to-day it averages four cents a pound less than the price of English home-made cheese. Now, why cannot we make as good cheese as they do in England, and command just as good a price ? The best experts in both England and Canada have been investigating this question for a few years back. I may say also that the officials of my Department have received hundreds of reports from all over England, and these reports say continually, "Your cheese it not up to the mark." We are finding heated cheese, badly cured at too high a temperature, much of which goes bad as soon as it leaves the factory. The great exporters of Montreal also frankly acknowledge that the cheese made this year is not up to the quality of that made a few years ago. Prof. Robertson and Mr. Ruddick have also been warning dairymen concerning this matter for the past few years, and we believe that we are now in a position to find a solution for most of the trouble.

Let me again say that as we conquered our position in the British markets in the first place, so also must we re-conquer what we have been losing there. Co-operation helped us out in the first place, and it is to co-operation that we must look

to-day. I am of opinion from all that I can find out that the chief cause of the deterioration in quality of our cheese is the uneven and high temperature at which most of our cheese is cured, kept and carried. Experts inform us that it is not so much the actual process of manufacture that is to blame so much as the temperature at which the cheese is kept in the curing-room, the temperature in which it is kept in store, and the temperature while in the holds of the vessels which bar that cheese to the British markets. Those who are familiar with the manufacture of cheese well know that there is a bacteriological process constantly going on in the ripening of the article. The higher the temperature the more rapid and the more injurious the process of ripening becomes. If, therefore, cheese be kept in the heated, ill-ventilated hold of a vessel during the process of ripening it is manifest that bad results must follow. I have asked the owners of steamship lines to put in cold-storage arrangements for the carrying of our butter. They informed me that so far as cold storage on board ships was concerned it had not been profitable for ship owners, although it had brought profit to the shippers of agricultural products. However, there is a difference between cold storage in closed chambers for the butter trade, and a system adapted for the carrying of cheese, which was simply a ventilated hall, so that cool and pure air might come in and hinder any injurious process during the carriage of cheese in the hold of the vessel. This plan has been put into three ships during the last fall, and the results were so satisfactory in the shipment of cheese and apples under the direction of Prof. Robertson that we are now trying to arrange with the companies concerned to put them into all their vessels. I hope that next year we shall see fifteen or twenty ships sailing from Montreal fitted with such a system of cold storage and ventilation as will carry our dairy and orchard products in such an improved condition as will tend to give our agricultural products the very highest place in the markets of Great Britain. (Loud applause.)

It frequently happens, also, that much of the injury comes to the cheese while being taken from the factory to the warehouse. I have seen cars in which I would not have cheese carried. I am, however, making arrangements with the railways to give better service in this respect, and I believe that the improvements promised when given will give satisfaction. The railways, in their own interests, must see to it that the cars they furnish will protect cheese from the heat of the sun. I firmly believe that as they have done so well in carrying our butter and fruit, so also will they do well in the future carrying of our cheese. (Applause.) The difficulty of the railways in providing adequate rolling stock is one that must be considered in this connection. Hon. Mr. Dryden spoke of the wonderful development of the country, and wonderful it has been. In fact so great has its growth been that the railways have found it impossible to meet the development of progress, and our country is to-day actually suffering from lack of rolling stock and other railway facilities for carrying our trade. It is to be regretted that our facilities have not been able to cope with the transportation this year, and is not likely to overtake it next year.

At present in most of the cheese factories of the country there is no adequate provision made for curing cheese in the proper way. The great majority of our factories cannot make really first-class cheese because they have not the right sort of curing-rooms. I again ask, why is it that English summer cheese is worth four cents a pound higher than Canadian summer cheese ? Mainly, I believe, because the temperature of that country is even; it seldom rises above 75 degrees, and for weeks and weeks is nearer 70, and so the cheese maker has a more easily controlled temperature than in our own case. There is scarcely a cheese factory in Canada in which the temperature does not rise some day in August high enough to hurt the product that may be in the factory at that time, and so long as our factories are like that so long will we run the risk of losing the cheese trade of Great Britain.

Now, we started the cheese business by adopting the principle of co-operation. It has been suggested that if milk is carried to the factory to be manufactured there into cheese, so also should the cheese of every group of twelve or fifteen factories be

sent to some central well-built curing-room, to be kept there until such time as by the slower process of cold storage it had ripened in just that condition required by the market. I believe the plan could be carried out with great advantage to all concerned. From what I know of the dairymen of Canada I feel assured that they will not rest content until they have found a satisfactory solution of the matter. Such a central curing-room might serve from fifteen to twenty-five factories, and would not cost more than $5,000 or $7,000. I venture to say that such a plan of curing cheese would be so satisfactory and beneficial, and there would be such an improvement in quality, as well as gain from loss of shrinkage, that the cost of erection would be paid in a single year. (Applause.) I believe, also, that cheese so cured would be of such a character and quality when placed upon the English market that not only would we regain our reputation of a few years ago, but we would soon command there exactly the same price that their home-made cheese does now. (Applause.) But we have never commanded that price, because our September cheese, though well made, has been too often lumped with our July and August cheese, which had been heated so as to be hurt in quality—and all were placed on the market as the best Canadian cheese, thus injuring the reputation of our best make.

I think it is the duty of an organization such as yours to weigh, and sift, and ventilate, and work at just such questions as I have brought before your attention. See that they are taken up and discussed, and keep at it until the remedy is applied. The Departments of Agriculture at Ottawa and Toronto are at your service, together with the staffs of the Agricultural College and the Experimental Farms. If you finally decide that a certain course of procedure is best, you may depend upon it that in my capacity as Minister of Agriculture I shall do the best I can to lead you in the matter. (Applause.) I make bold to say here to-night that if something is not done to meet these difficulties of curing and carrying our cheese, then our cheese industry will suffer in the future even more than in the last year.

The President: If the two Governments will do all they can, as indicated in Mr. Fisher's address, they can depend upon it that this Association will see the matter through just as far as it is possible for it to go. (Applause.)

A WESTERN VISITOR SPEAKS.

By Andrew Pattullo, M.P.P., Woodstock.

The speaker, after a few introductory remarks, in which he chaffed the President about the Brockville and Woodstock districts respectively claiming to be the "original home" of Canadian dairying, proceeded to say: I was delighted to hear Hon. Mr. Fisher speak to you in the very candid maner in which he addressed you, even though there was what might be called a tone of pessimism in his speech. I believe that tone of pessimism was necessary, if we are to cope with the dangers that threaten the cheese industry. I believe he has not only indicated the danger, but he has also shown the way in which it can be avoided and overcome. I was also pleased with Hon. Mr. Dryden's remarks regarding agricultural education. We have had two systems of education in this country. We have the ordinary public, high school and university system; but did it ever occur to you that we have also a system of agricultural education which has gradually developed into a system of education quite as important, if not more important, than the work of our high schools and our universities? What are the objects of this meeting? The members of this Association go to the great trouble of arranging for this gathering, why? Simply in recognition of the fact that education is power. There is no sphere of usefulness in which education spells power more largely than in the domain of agriculture. The system of agricultural education which we are developing in this country is of more importance than our public schools, high schools, and universities. We have, in this connection, not only the best Agricultural College in the world, but we have what

may be called a system of university extension work—a system in which the same sort of education that is given at the Agricultural College is carried to people who are unable to attend that institution. This university extension work is carried on through conventions such as this, through the Farmers' Institute, and by other like means.

The importance of the educational work carried on is strikingly illustrated by the figures given in the President's opening address. This Association is 25 years old; for 25 years it has been carrying on the work of education along dairying lines. To-day, our dairy exports are valued at $25,000,000, or $1,000,000 for every year this Association has been in existence.

This is something more than a mere financial matter. But for the creation of this industry, which owes its origin to two or three men, Mr. Farrington of South Norwich, and Prof. Arnold being two of them. there would be tens of thousands more of our people in the United States to-day. It is dairying that has saved the situation. We have had our up and downs in every line save that of dairying. Grain-growing has had its up and downs; our horse interest has gone up and down; every industry except dairying has had its period of depression. But, in all the years since dairying was first established there has been but one in which that industry has not given profitable returns.

We dispute somtimes as to who are the nation-builders. It has been said that the man who makes two blades of grass grow where but one grew before is a benefactor of mankind. A still greater benefactor is the one who causes the production of something where nothing was produced before. We are merely on the fringe of our possibilities in this matter. The production of the soil can be doubled right here in this country. You can produce $1,000,000 more in cheese than you are producing now; and, so far from lessening your other farm products by so doing you will rather increase them.

Mr. Pattullo also said he felt quite sure that in a few years time there would be 50,000 Americans coming into Canada, and closed by an eloquent peroration describing a view of Naples as recently witnessed by him.

PRACTICAL CHEESEMAKING.

By G. G. Publow, Instructor at Dairy School, Kingston.

Perhaps some of you makers here think from what has been told you about low curing that the only thing necessary for the making of first-class cheese is a good cold-storage room for curing. Now do not run away with the idea that cold storage is the only thing required for successful cheese-making. I would like you to understand at the very outset that while cold storage is a necessity, it is not a cure for all the evils. You must also have a good building to make your cheese in, and have good milk sent you from which to make that cheese. I do not believe that you can take inferior milk, manufacture it into cheese, put it into cold storage, and get a good article. If it can be done I would like to see it performed.

In making cheese it is requisite that there should be a well-built factory for the purpose. What is wanted in cheese is good texture and flavor, and the right texture and the proper flavor can be got only from good milk. I like to receive the milk in such sweet condition that at the adding of the rennet it will give me sufficent time to expel sufficient moisture and has acid enough—acid enough to pull apart, and be firm and alive. If the milk is over ripe it will be difficult to get this desirable condition. If milk has to be handled quickly at the factory it means loss to the patrons. Use enough rennet to have the milk coagulate and fit for cutting in about 25 minutes at a temperature of about 86 degrees. Cut the curd as soon as it will split clear over the finger of some smooth instrument. I usually find this condition in about twice and a half the time the first signs of coagulation show. If

it takes ten minutes for adding the rennet allow twenty-five minutes for thickening up. Cut the curd carefully, and into cubes of uniform size. I do not care which knife you use first, if the cubes are of uniform size. Commence stirring immediately after cutting the curd. I prefer an agitator. If you stir by hand you are apt to stir the curd into balls. Stir gently, to ensure against loss.

In cooking, it is well to remember that this should be done according to the amount of fermentation that has taken place in the curd. There has been too much stress laid on cooking the curd at ten or fifteen minutes, or at half an hour. If you find that it will shrink rapidly, then cook rapidly, but if it will shrink slowly, then cook slowly. It may take an hour, or it may take only fifteen minutes. When the proper amount of moisture has been expelled it should give you a good body and texture. Be sure that the curd is what we call "lively."

As to temperature you will have to use your own judgment. In some cases 95 degrees may be sufficient, but it may take 102 or even 104 degrees; it will depend largely upon the richness of the milk. In the spring take a lower temperature, and as the season advances you will have to increase it. Cook it sufficiently long enough to get a proper condition of the curd. The amount of acid in drawing will depend upon the amount of moisture in the curd, as the acid develops from the moisture in the curd. If you have too much moisture the curd will break down, and there will be an injury to the texture. If you take out too much moisture the curd will be too dry or "corky," and never become meaty cheese.

Mat the curd so that it will mature evenly. I do not care whether you pile it one, two or half a dozen; only pile it in such a manner that the temperature and the moisture will be uniform throughout. Keep the temperature at 96 degrees from the time you draw the whey until you have an inch and a quarter pull on the hot iron. Then mill the curd. The condition of the curd at that time should be mellow and meaty, and when you tear it apart it should show a fibre like lean meat. Mill the curd with a machine that will cut the curd into uniform pieces. Immediately after milling expose the curd well to the atmosphere, stirring it for about fifteen or twenty minutes. Then let the curd rest. Next stir occasionally, and keep piling the curd higher until it shrinks and will be soft and pliant and mellow, and tear off like a piece of meat, and have a nice, fresh-butter flavor. If it is not so treated it will likely be rubbery, and will make an open cheese. The maker should have his sense of touch educated, so that he may tell by the feel of the curd whether it is in proper condition or not. The warmer the curd the more mellow it will feel.

When the curd has reached the condition just described I would salt it. In cheesemaking the best salt is none too good. In applying the salt put it on evenly and slowly, so that all the curd will get a fair share, and that it will thoroughly enter the curd. I would recommend a hair seive for putting on the salt. Stir the curd well at the time, and keep it well apart. After the salt is well dissolved, and the curd has become mellow, it will be ready for the press. When hooping curd aim to have the same quantity in each hoop for the sake of uniformity in the size of the cheese. Keep the curd well up in the centre, so that when the pressing comes it will be more evenly distributed. Then take the cheese out of the press and dress them neatly. See that the bandage is even. If the curd has been oilly, wash it well with warm water, or wrap a cloth around the edge to absorb the fat. Put the cheese back into the hoops and press gradually for about an hour. Then let them remain in the press until the next morning. If the cheese have any shoulders on take them off. If you find that the cheese are not in good shape, wash them and put in the press for two days. Then put the cheese on the shelves at not more than 65 degrees, and keep as near that or 60 degrees as possible. Turn the cheese every day, and see that there is plenty of moisture in the room. If you attend to these instructions I feel sure you will have no complaints from the Montreal buyers.

Mr. Echlin : Does not high piling make the fat run out more ?

Mr. Publow : Slow piling would be better; but it takes too much time.

Mr. Echlin: Then you think that the waste from fat in curd is largely due to some cause such as dry pasturage?

Mr. Publow: Yes; something of that sort.

A Member: What about racks?

Mr. Publow: I believe that if there were more racks used there would be a better body in our cheese.

Mr. Echlin: Would not an ordinary cheesemaker find a difficulty in making cheese one day on the rack and another day in the pan?

The President: Don't have both; stand to one or the other.

Mr. Publow: The man who is using racks can always give a little more moisture; if you are on the pan you have a drier cheese. The great trouble to-day is that there is lack of uniformity. The racks do not stir quite so dry; if you did you would have to give a little more acid. If on the pan you can make more firm with a little less acid. The object of the maker should be to retain the proper amount of moisture and the proper amount of fat. The maker should have in mind just the kind of cheese he wants to make—whether the cheese is to be mellow in two or in six weeks. If you want it mellow soon you must have more moisture; if to be mellow in six weeks, then it must be a little drier. Why is it that some of our cheese is reported back from England as "Fancy" and "Good," while other cheese shipped in the same boat—in the same consignment—are poor? The trouble lies right here: You are asked for soft cheese that will break down in Montreal in about two weeks, and these are shipped to Great Britain under the same conditions that firmer cheese are sent. (Applause.) We want cold storage, and I hope that we will get it both on the trains and on shipboard, but we must also see that the maker produces the kind of cheese that will keep and carry.

Mr. Echlin: If the first fifteen days are the most important in the life of a cheese, are we asking for something unreasonable in putting so much responsibility on the transportation companies?

Mr. Publow: Patron, maker, buyer and carrier must all work together. Each and all of them have a large amount of responsibility, and should live up to the full measure of it. But very, very much depends upon the early days of the curing of cheese. The cause of curing is fermentation, and if you get the right fermentation it is less likely that the cheese will go bad in transportation.

Mr. Ryan: Do you believe that mellowing down curd will make any difference in the quality?

Mr. Publow: That very thing itself is a process of curing. The curing is continuous, and the process goes on in the vat. After you cure you get the curd firm. The changes are still going on, the cheese is becoming softer, and the more you cure it the softer and more mellow it will be. I believe in curing the curd well before you salt it or press it.

Mr. Newman: What would be the chief advantage of cold storage for cheesemaking?

Mr. Publow: If we had cold storage we could send a moister cheese; we would have that advantage by having a longer time in which to cure our cheese.

Mr. Newman: Must we have less moisture in making under the cold storage plan?

Mr. Publow: That will be a matter of experience and judgment. If you hear good reports of your cheese—that it is mellow and meaty in a reasonable time—then it will be all right. But stop making so as to have a mellow cheese in two weeks. Make them firm, cure them mellow, and then send them to market. A cheese should break down in about a month.

Mr. Newman: How much milk should it take to make a pound of cheese?

Mr. Publow: With the average milk it should run from about 10.4 to 10.6 lbs.

Mr. Newman: Some say eleven pounds.

Mr. Publow : There is something wrong when it takes eleven pounds of milk to make a pound of cheese. Most of the milk that goes to the average factory will range from about 3.2 to 3.4 of fat.

Mr. Blick : Do you think it is fair to judge by any one section ? We ship every week; some ship every two weeks. We often have our dividends for the month made up the 15th. The cheese going into cold storage would not give us so rapid a return, and our cheese would go into cold storage with those that go every two weeks.

Mr. Publow : That is an argument in favor of uniformity. If there was a man going about for a syndicate, and looking up steady shipments it would be a great advantage. I would advise you to stick to the Peterboro' quality of goods. Don't go back on your present plan. Improve it if you can. Let your motto be "Quality first, yield afterward."

Mr. Ryan : How long should cheese be left in the room before shipping ?

Mr. Publow : I believe that under good conditions cheese should stay in the home factory about fifteen days. Turn them every day, and see that they are kept clean and neat. If you have some place where they can be kept at a lower temperature of course you could let them leave the factory sooner.

Mr. Blick : We never ship before ten days.

The President : We must have uniformity. The best way is for every maker to attend one of our Dairy Schools. Then when they go home they can make a uniform quality of cheese. The instruction in these schools is as free as the air you breathe.

Mr. Ruddick : Mr. Publow has well said that there is no more critical point in the making of cheese than the regulation of the moisture. Nearly all the manipulations that take place in the manufacture of cheese have something to do with the amount or control of moisture in the curd, and the fine balance is one that calls for the greatest skill that the cheesemaker can exercise in his work. I would not. however, have the impression go out that all the complaints against the quality of our cheese are on account of the too great amount of moisture left in the curd. There have been complaints in some districts about the cheese being too dry. This has been the case with some of our western Ontario cheese. Too little moisture gives a harsh, dry, crumbling cheese. Then there is a mealy condition in hot weather cheese that you find when the curd has had too much acid. In most cases, however, the trouble is with cheese going off on account of too much moisture being left in them. Last season and the season before there were complaints of too many open-bodied cheese. These were made during the sudden cool weather, and not enough acid was allowed to develop before the cheese was put to press. I would like to ask Mr. Publow what variation he finds between making in spring and in late fall ?

Mr. Publow : From about four to six degrees. About 96 degrees in the spring of the year, cooking in about two hours and a half after the adding of the rennet. Weakness in cheese is largely the result of lack of judgment on the part of the maker. If you would have your cheese right you must have the right body at the time you remove the whey and when the salt is added. If the curd has too much moisture and is breaking down fast, it will make a weak cheese with too much acid. They will be a little open and too stiff. Too many makers are using a quick starter, working the curd very fast, and by so doing they are destroying the texture of the cheese. The trouble is that too many of them want to get the cheese out too early.

Mr. Newman : Even in a properly built curing-room will there not be a time in midsummer when it will be so warm that it will require some artificial means to reduce the temperature to the best working point ?

Mr. Publow : In my district there are twenty-five factories that have adequate means of controlling the temperature. Two had sub-earth ducts. One worked well and the other did not do satisfactorily. In all these twenty-five factories I found good cheese. Most of these factories have put up an ice-house beside the factory. Some of them have racks on the top shelves, and some a few feet from the floor.

These are just scantling on the edge, with a pan below to catch the drippings from the ice. They put them in the centre of the building, keeping the boxes full of ice, and the arrangement works well generally. If you use ice, put it in early. Do not wait until the cheese are beginning to go off from the heat. Fix the building first. It is no use of having an old shell of a factory and putting ice in there.

DAIRYING FROM A QUEBEC POINT OF VIEW.

By H. S. Foster, President of the Bedford District Dairy Association, Knowlton, Que.

We are confronted to-day with something that has never before faced us. This great danger to the success of the dairy industry is the lack of uniformity in our cheese. I live in the Eastern Townships of the Province of Quebec. You in Ontario set us the example of co-operative dairying in the first place, and we look to you now to take the lead in grappling with this present day difficulty of uneven quality in our cheese product. We have too many cheese factories in our district. There is hardly a factory there that has the milk of more than 500 cows. I believe we should haul milk by contract, and have the milk of 1,000 or 2,000 cows for each factory. I have been trying hard to do this in the Eastern Townships, but so far with but little success. We recently had an address from a Glasgow exporter, in which he told us that there was a factory in Ontario known as the Black Creek factory for which he had paid one and a half cents a pound more than for that made in any other Canadian factory. That factory, he said, turned out about sixty cheese a day during the making season. The consolidation scheme mentioned by Mr. Fisher is capital in the meantime, but I think the time is very near when all of our factories will have to be larger, and each of them have this equipment. Our butter interest during the last year has increased almost double. But while we have sent out a comparatively large volume of butter, there is also some difficulty here also on account of the smallness of the factories. We must have larger and better equipment in both our cheese factories and creameries.

When I heard the unfavorable reports regarding the cheese markets last season I thought it was on account of the exporters having stepped over the limit in the previous year, but Prof. Robertson has assured me that it is chiefly because of the poorer quality of the cheese made and exported. But we have produced a fine quality of cheese in the past, and I think we can do so again. (Applause.) We must organize our factories on a scale that will warrant the employment of experts who will be able to solve this problem of a better and more uniform quality of cheese.

It is plain to everyone, however, that one great hindrance to the success of the dairy industry is the lack of proper treatment of transportation. In the Eastern Townships of Quebec, where we are depending almost entirely upon one railway line, we are kicked about just as that corporation likes. I think the time will soon come when the people of this country will rise en masse as the people of the United States did, and will settle this question to their own satisfaction. I am delighted to learn that Hon. Mr. Fisher and the Government are going to take up this matter of better transportation for our agricultural products. It is only just to the producers and shippers that our freight rates should be put on a lower and fairer basis. I have been much pleased with the good work done by this Association. You have been an inspiration to us in Quebec. The production of winter butter is becoming more and more important. With us in the Eastern Townships there are many advantages for butter making. The country is hilly, and there are plenty of springs and fine pasturage. But the great trouble with us is that we have been letting the cows milk for only a few months in the year. Let us urge more dairy work in the winter months, for that is the time it pays best.

The question of ventilation is also an important one. I have devised a plan which is now in operation on three farms that have come into my hands. It is the result of a series of experiments, and I think it now works satisfactorily. Mr. Forster then explained in detail his plan. It consists of a series of tubes running from within a foot or so of the floor up to and out of the eaves, on each side of the stable, and which are opened or closed according to the direction of the wind. He had lately put in this method in a barn of 40 x 100, where they had 55 head of cattle, and it is working admirably. He added : I can recommend my plan of ventilation. In fact, I will pay any man who will put in this system for himself if he does not find it a success. It does not disturb anything in the ordinary barn or stable. It enables you to take advantage of whatever way the wind is blowing. It is also a cheap system of ventilation. Let me again thank you on behalf of Quebec dairymen for your kind reception of me at this grand convention. (Applause.)

BACTERIAL INFECTION OF CHEESE.

By Dr. W. T. Connell, Bacteriologist, Queen's University, Kingston.

It has been my privilege to come before various meetings of this Association and to address its members upon the relationship which bacteriology and bacteria bear to dairying. So to-day I am going to continue this series of addresses and speak on the old topic of the "Bacterial infection of milk, its sources and result."

It is hardly necessary nowadays for me to remind the audience that bacteria are minute microscopic plants which increase exceedingly rapidly in numbers by a process of fission, i.e., simple division, when they are placed under suitable food and temperature conditions. Given these favorable conditions for their growth and vast increase they will rapidly bring about changes in any material upon which they are developing, and lead to various fermentative or putrefactive changes. Milk is a very good food material for a number of species of bacterial plants, just as it is a good food material for man and animals. If these species make their way into milk and the temperature conditions are favorable, then they will rapidly multiply in the milk and bring about changes in it.

In the same way curd and cheese afford fairly good food material for bacterial development, though not so good as milk. Butter is not a good bacterial food when it is properly made, but when it holds large amounts of buttermilk then it becomes a better foodstuff for these plants, and a poorer one for the human consumer.

It will surprise none of you to learn that in both cheese and butter making bacteria are essential and necessary. In fact, upon their presence, growth and action depends the acid production in the making of the cheese, which acid is so essential both in the course of manufacture and in the process of curing. In butter making bacteria are essential to the ripening of the cream, and thus play an important part in the production of the flavor of the butter. Both these processes are dependent upon bacteria which produce lactic acid without at the same time breaking up the sugar present into gases and putrefactive compounds. In our cheddar cheese and creamery butter of first quality we find bacteria of these species present alone, and such species must be looked upon as the natural or desirable forms. I have found that in Eastern Ontario at least these forms all belong to one species known as the B. Acidi Lactici (Esten) (No. 208 of Conn, or Hansen's), and that these species are present in the vast majority of all milk when it arrives at the factory or creamery. They are not present in all samples of milk, and are often when present not found alone, but mixed with other species, though in most good milk they are the dominant micro-organisms.

Where do these bacteria, that are so requisite in cheese and butter manufacture, come from, and what are their results ? Prof. Conn, in 200 examinations of milk, di-

rect from the cow, where the milk was collected into sterilized vessels with a narrow neck, found this species only five times, but when the milk was collected in larger vessels he found this organism in almost all cases. He concludes from this that the bacterium is not derived from the milk ducts of the cow, but falls in from the air and dust of the milk shed or stable. Other experimenters have, however, had a larger percentage of cases where they found these lactic acid bacilli in fresh-drawn milk when very carefully collected, so that it is reasonable to suppose that these bacteria are not uncommon inhabitants of the teats of the cow, and are washed out with the first streams of milk drawn. That infection also occurs from the air and dust of the stable there can be no reasonable doubt, yet experiments made by the exposure of materials upon which these bacteria could grow have very rarely been followed by positive results. Another source from which there can be no doubt that infection of the milk with these bacteria frequently comes is from the milk pails and milk cans themselves. Of course, where these are carefully washed and scalded such an occurrence would not be common, but when such care is not taken, and particularly when sour whey is brought home in the milk cans, such a source of infection must be exceedingly common, and would be increased still more if the cans were not perfect, i.e., had cracks or roughened surfaces in them. Thus it will be seen that the cheese and butter maker who employs no starter practically depends for the seeding of the milk with the proper acid forming and ripening bacteria upon the farmer and his cows. Right here comes in the importance of the proper care of milk. If the milk is kept at a high temperature we find the conditions are favorable to bacterial development, while if the milk is kept cooler, say down to 60 degrees F., the conditions are not so favorable, though development will go on slowly. If a milk has been seeded with the common souring bacteria and the temperature is 75 degrees F. over, it would not take many hours for the milk to become over ripe or actually sour. Kept at a lower temperature still it would take double or triple the time to produce the same result, and the lower the temperature goes the longer will milk keep. Most large milk companies who supply milk for drinking and household use demand that their dairymen cool their milk as rapidly as possible after milking and preserve it at a temperature under 55 degrees F. It is not necessary to be quite so radical in butter and cheese-making, but milk for butter-making should be cooled to 60 degrees F., while for cheese-making 65 degrees F. to 68 degrees F. should be required. Many cheesemakers might say that if all milk were cooled and preserved at these temperatures that the milk would take a long time to ripen and to develop acid. I would say that I would rather ripen milk where I alone could control the conditions of ripening, than permit it to be done in an erratic manner at the farm. Further, every up-to-date cheesemaker knows that by the use of pure culture starters he can control his acid fermentation much better than if he depended upon its natural development. The use of starters I am glad to say, is decidedly on the increase in Eastern Ontario, and I think that it is a good thing. But I would utter a word of warning in their use, and that is that they must be used judiciously, and not employed simply as a means to hurry through the day's work regardless of the necessity for their employment. These lactic ferment starters, which are simply pure growths of active lactic acid bacilli, are now prepared at the Dairy Schools at Guelph and at Kingston, and are furnished to makers for the cost of materials and mailing, i.e., 20 cents per bottle.

I have already very shortly touched upon the results of and the necessity for the presence of these lactic acid bacteria in milk when it is to be manufactured into butter or cheese. When one follows the course of events bacteriologically in cheese manufacture one notes a progressive rise in the number of these bacteria in the milk and then in the curd until the cheese goes into the curing-room, where after remaining a few days stationary we have a progressive decrease in their numbers, though they never seem to entirely die out even after two years. What part do they play? The acid which they form from the milk sugar has an important effect on firming and mellowing of the curd. I am not pratical cheesemaker enough to describe this quite properly. Further, there can be no doubt that the acid is important in the curing

process, and I cannot but think the old idea which has recently been revived by Russell and Babcock of Wisconsin, that the rennet (or rather the pepsin ferment in the rennet) cures the cheese, has much to back it up. We know that rennet is an extract from the digestive part of the calves' stomach which contains the milk-curdling rennet and the digestive ferment pepsin. We further know that acidity is necessary for the proper action of this digestive ferment, and this is furnished by the lactic acid manufactured by the lactic acid bacteria.

So far we have been considering infection by a species of bacteria that are so commonly and constantly found that we must consider them to be practically natural to milk and its products. I now must direct attention to some other species which occasionally infect milk, and lead to more or less serious trouble in the process of manufacture, or in the cheese itself. With butter my experience is so limited that I will make no remarks.

Besides the pure lactic acid species there are a number of species which while they produce acid in the milk, also form gas and putrescent compounds--such species are the B. coli communis and its subvarieties, e.g., the B. lactis aerogenes. Both these varieties flourish well on milk and produce acid, but at the same time form gas and lead to putrescent changes in milk. The B. lactis aerogenes causes the milk to take on a very sour odor. These forms and related species are quite common in milk at all seasons of the year, but are particularly common in winter milk and during the hotter months of the year. They are common in winter milk because the sources of infection with such species are most common then. They are frequent in the hotter months of the year simply because if infection happens to occur then the temperature is so favorable for their development that they rapidly increase in numbers. In my experience contamination with these species is the most common milk infection after that of lactic acid bacteria. Where do these species come from ? Both these forms are very common, the colon bacillus, constant in the manure of animals and fowls, so that in and around the farmyard we have always infecting sources. How do they get into the milk ? There are several methods, and one or all of them may be present in any case. The manure dries and becomes broken up into dust to float around in the air and fall into the milk during milking, or into the milk can in the milk shed. This is a source of infection that in summer is seldom absent. In like manner the dust may arise from a neighboring hog pen, or from the road, and blow into uncovered cans. Then there is a great lack of cleanliness in milking. How many think of brushing off the cow's udder and sides thoroughly before milking—removing dust and any adhesive manure particles and loose hairs ? If these are not brushed away they will gravitate naturally into the pail, and I have found that there is a close relationship between the bacterial cleanliness of milk and the cleanliness of the strainer. The cleaner the strainer the freer the milk is from contaminating bacteria, and where one finds a foul strainer one must expect (and seldom be disappointed) a bacterial contamination of the milk.

My experience of the last four months with the new milk supply company of Kingston warrants me in making this statement, and what is true of this dairy would apply much more decidedly to ordinary factories and creameries, for the company exercises a strict supervision over its milk supplies. Another common source of infection is the filthy habit of milking with wetted hands. Less could be said against this practice were the udder and teats of the cow thoroughly cleansed. but one knows how rarely this is done, and the consequence is that the washings of the teats and udder find a lodgment in the milk pail. It may be that one milks easier with a wetted teat, but one also milks in a less cleanly manner.

Lastly, we have as an infecting source the milk pails and cans. I pointed out before that seeding with the ordinary acid producing or souring species frequently came from this source, and so, too, does infection with these undesirable forms, as when milk pails used for the evening's milking are permitted to lie around the stable or milk shed to gather dust and be used without washing for the morning's milking. With milk cans the danger lies more particularly in those cans where very foul, perhaps

putrid whey, is brought in the cans. It is next to impossible to get rid of all trace of this foul matter from the cans, so that infection no doubt comes frequently from this source. When we add to these sources of contamination such subsidiary sources as a foul water supply at the farm and a careless washing in at least 20 per cent. of all cases, one will have exhausted the main sources of infection of the milk at the farm. Regarding the purity of the water supply of farms I can only call your attention to Prof. Shutt's summing up of his analysis of over 1,000 samples of farm well waters, when he reported that the majority were but diluted cesspools. In this particular I can record an instance that came under my own observation in September last. I drove out to the farm of a prominent dairyman some miles out of Kingston, and he called my attention to a mineral well he had quite near to his stable. I pumped out some of the water, and from the smell and taste came to the conclusion that the mineral was diluted "extract of stable." To confirm my opinion I had the sample analyzed and found my suspicions correct, so that I now have my own opinion of all mineral wells in or around stables or factories.

Last June I made a visit with Mr. Publow to a factory in his district, where they had been suffering from a bad flavor in their cheese. The factory and surroundings were in excellent shape, but the milk that came in was not, and I did not wonder at some of it not coming in as good as at night, for on our way to the factory we passed the houses of several of the patrons, whose milk stands were on the roadside some distance away, and we were enabled to see the methods employed for cleansing of cans. Water was brought down from the house and the wash clothes were hung on the fence, and seemed to have been on duty for some weeks at least. Out of curiosity I took away with me part of one wash cloth, and was not surprised when I developed from it quite a collection of gas-forming and putrescent organisms.

It does not quite come within the scope of this paper to cover the sources of bacterial infection at the factory, but I can sum them up by saying that improperly constructed factories leading to the accumulation of filth and a consequent multitude of flies in the factory itself, or around it, improper drains, foul whey tanks, and the contamination of the factory water are the chief infecting sources at the factory.

Now what are the results of the entrance of such species as the B. coli and its congeners into milk? Everything will depend upon whether the conditions are made favorable to their development and growth. If the favorable conditions are not present then there will be produced no tangible results. It is just like in an epidemic, many people may be exposed to the germs of infection, but the conditions are not favorable for the development of the bacteria in their bodies, so that they escape infection. The conditions that are favorable for their development are moderately high temperature, over 70 degrees, and a small number or an absence of the common acid-forming species. Given these conditions they may lead to very serious results, the severity depending on the freedom of their growth, or lack of control of their growth. Thus in curd we may find all stages of gas formation, from minute pinholes to foul floating curds. Sometimes there is not so much gas accumulation in the curds themselves, but the curds have a bad odor. Again, in the cheese, particularly if the curing temperature be high, we may find open cheese, though much more commonly owing to lack of milk sugar to ferment, we have the production of various grades of bad flavor, from a faint "off" flavor through various gradations, ending in the rancid stinking cheese. These then are the results of the entrance and growth of such species as the varieties of the colon bacillus, and as can be seen at once, they are undoubtedly the most important of the bacterial taints of cheese. There are a number of other rather important infections of milk, among which we have such conditions as fruity flavor and bitterness in cheese.

On the subject of bitter cheese I have nothing to offer, though I am pleased to see that Prof. Harrison of Guelph has worked this subject out.

On fruity flavors I have done some work, and I am inclined to place this flavor under a subheading with those produced by varieties of the colon bacillus. I do this

because in a specimen which I examined in September last for Mr. Publow I found a bacterium of the species in quite large numbers along with the ordinary lactic acid species. Mr. Publow brought forward the interesting fact that in this factory whey starters were being used, and with their discontinuance the trouble cleared up.

As Mr. Publow had brough me some of the whey used as a starter I was able to demonstrate the same species in it as in the cheese.

Mr. Ruddick informs me that he always fancied a resemblance between this flavor and that of old whey, so it seems possible that Mr. Publow has found the source of infection in this trouble, though it needs much more careful demonstration than has yet been effected.

On a number of occasions I have been asked if I had an explanation to offer for the yellowish to orange discoloration that at times is found on the ends of cheese in the curing-room. In some cases no doubt it is due to the kind of material used for the curing shelves, but in the majority of cases that have come to my notice this trouble is due to the action of the acid of the cheese (particularly in "wet" or "heated" cheese) on mould growth. The common blue or green mould, when exposed to the action of acid, turns yellowish or orange, as I can demonstrate to you in this tube. I record this because I am often asked about it, and by adding it to the paper it will reach many others who desire an explanation.

To sum up my paper, I may say that the propositions that must be laid down are : (a) That the entrance of certain pure lactic acid producing bacterial species is essential and necessary for the proper manufacture of cheddar cheese and ripening of cream, and that seeding with such species almost always is brought about naturally, and if not naturally seeded their place may be supplied by artificial cultures. (2) That seeding with species such as B. coli communis and B. lactis aerogenes is also common under the conditions in vogue on most farms, and it is, therefore, essential that we should take measures, first, to reduce the probabilities of the milk being so seeded, and, secondly, to prevent or check the development of any bacteria that have gone in. To do the first it is necessary simply to follow the general rules of cleanliness. To do the second we must depend upon proper aeration and cooling of the milk at the farm. The combination of cleanliness with proper care and cooling of the milk will lead to milk being delivered to the factory in superior condition for its manufacture into prime butter and cheese. I would commend to every dairyman and dairy worker here a careful perusal of the bulletins published by the Commissioner's Branch, Department of Agriculture, Ottawa, on the care of milk for cheese factories and for creameries.

I will also read to you the regulations which govern some of the large dairy companies in our cities, and you will see how far the average dairyman is from the ideal of the city dairyman who looks for a supply of milk of first quality for household use.

REGULATIONS OF CLARIFIED MILK CO. OF KINGSTON, LIMITED, FOR GUIDANCE OF DAIRYMEN.

1. Milkers must clean their hands and persons thoroughly before milking.

2. The cattle must be rubbed free of dust, and if udder is dirty it must be washed with a damp sponge, which must be kept thoroughly clean.

3. Milkers are advised to milk without wetting the teats.

4. Milking is to be carried on in clean stables or sheds, free from dust, and milk is to be handled and preserved in a non-dusty place. Cattle must not be fed with dusty food before milking.

5. The milk must be aerated and cooled as rapidly as possible after coming from the cow. The milk must be cooled and preserved at a temperature between 50 and 55 degrees F. until delivered to the Company. All milk must test 3.5 per cent. butter fat.

6. All milk must be carefully strained through several layers of cheese cloth or coarse cotton. The strainer cloth must be washed and boiled after each milking

7. The milk pails and utensils employed must be in good condition and properly washed and scalded before using.

The cans (furnished clean) must be rinsed with clean cold water before milk is placed in them.

8. Stables and cattle are to be kept in a clean and sanitary condition, and are to be subject to any regulations instituted by any Legislature, Council. Board of Health, or by any other body having jurisdiction in the matter, and are subject to inspection by the company's officials and veterinary surgeon at all reasonable times.

9. The feed of the cattle must be carefully regulated so as to cause no taint in the milk.

10. No milk is to be supplied from cans within five days after calving.

I may end by saying that regulations such as these are by no means too ideal. They are only what are essential and necessary nowadays to supply the public demand not only for the direct use of milk as a food, but for its use in the making of the best article of buttter and cheese.

Mr. Green : What would be the action of this fruity flavor on milk ?

Dr. Connell : We frequently meet with a condition where the milk will curdle without souring, and from it we often separate the bacillus commonly found in hay dust, and known as the hay bacillus. This appears to curdle the milk without souring it. It is a sort of sweet curdling—a sort of sweetish flavor is given it. Why this bacteria from hay dust does not come in oftener I cannot tell. Perhaps the acid has some effect upon them.

Mr. Ruddick : There are many valuable hints and suggestions in Dr. Connell's address. If we all took them to heart there would be a great improvement in the quality of our cheese and butter. I would like to emphasize the point he has made regarding the cooling of milk for dairy purposes. At the time of the introduction of aerating machines it was claimed that it was only necessary to let the milk pass through them once, and that any further cooling process was unnecessary. Now, I say as plainly as I can that in warm weather aerating alone is not sufficient. The mere act of aerating milk tends to hasten rather than to delay the process of fermentation if not done under cool conditions. It is therefore most important that the milk should be cooled in warm weather. It is only by so doing that a cheesemaker can control his milk in a proper manner. Too much milk is handled in an over-ripe condition.

Mr. A. Forster : Would you advocate coooling as well as aeration in cold weather ? I have a vessel made with a perforated bottom, containing about two quarts. I plunge that down into the milk and when it is raised the milk streams through. Is it an advantage to aerate that two quarts at a time ?

Dr. Connell : I would advise aeration at the temperature of the air ; but the preservation of the milk depends entirely upon the cooling.

Mr. Ruddick : A good deal of injury is done to milk because the work of aeration is carried on in places where the atmosphere is not free from dust and odors. I believe that it is an injury instead of a benefit to aerate milk in the yard where the cows are milked. I thoroughly believe in the advantage of aerating milk, but it must be done in a place where the atmosphere is pure and wholesome.

The President : After this address of Dr. Connell's we must take more pains than ever to keep everything about the dairy sweet and clean. Let everything about the place be scrubbed. Begin with the hired girl. (Laughter.)

At this point the President announced that Prof. Dean, who had been attending the Vermont State Dairy Convention, was on the Imperial Limited express train on his way from Montreal, and had asked the President to try and have the train stop at Whitby, as a special favor. The President had wired Superintendent McGuigan to that effect, and had received a reply stating that while it was the custom to refuse any requests of this sort, yet on account of the importance of the work of the Association orders had been given to let the Professor off at Whitby.

"Not only the politicians, but the great corporations are coming to our aid," remarked the President, amid loud applause.

PERMANENT PASTURE AND HAY MIXTURES.

By Dr. James Fletcher, Botanist, Central Experimental Farm, Ottawa.

I am quite aware of the fact that some persons have succeeded in keeping fifty head of cattle on a hundred acres of land, and have not used pasture. But even Mr. Gould found it necessary, with his intensive method of farming, to have twelve acres of pasture. Farmers must have some grass growing for their stock.

We have had about 400 varieties of grasses grown and tested at the Central Experimental Farm, Ottawa. There are about 300 different kinds of grass growing wild in Canada, and some of these are very much more valuable than others for the farmer, and some are better suited for one locality than for another ; and yet in the face of this we find that many farms have not yet learnt that some of these more excellent grasses can be grown by them. In fact notwithstanding the work that is being done at the experimental farms, we find that farmers are confining themselves almost entirely to timothy and clover. We receive many questions at Ottawa regarding hay mixtures, chiefly as to what is the proper proportion in which to mix timothy and clover for sowing, and the period when the cutting should take place in order to make the best hay. We fear that it is too often the case that the men who secure this information go back to the old system that their neighbors have been carrying on for years.

Now, regarding the timothy and clover mixture, the best results will be obtained by sowing twelve pounds of timothy to eight pounds of clover seed. We have found that mammoth red clover has a heavy crop at first, but will not do so well later. Another point in favor of the old common red clover is that while it has less stalk it has relatively more leaf, and yields a large aftermath. But it is usually in its best condition for cutting about the 18th to the 24th of June, while the timothy is not ready for a week later, and by using the mammoth red clover both it and the timothy will mature about the same time. It is important that the plants in the mixture should mature at the same time.

Mr. Gould : Is not the mammoth red clover a rather coarse, stalky sort of clover.

Dr. Fletcher : That is perfectly true ; but at the same time it is an excellent food, and it is after all only a matter of comparison, which the stock do not appear to mind. We find that where it is grown it gives a heavier crop the first year than the common red, but not quite so much the second year.

It is most important that the hay should be cut at the proper time. We all know that the right time to cut ensilage corn is when the seed has formed, and it is getting to the glazing stage. It is then in the most nutritious condition, and there is not too much fibre. The proper time to cut grass for hay is at the period when it has made the greatest growth, and when the seeds have formed but are not sufficiently advanced to take up all the energy of the plant in maturing them. Do not let the crop get too far advanced before cutting.

In regard to the pasture mixtures at Ottawa, there are some which have had more success than others. We have had experiments going on with these mixtures for ten years. We have been trying to get a grass or hay that would give to the stock a nutritious food, with some variety about it, and a crop that it would repay the farmer to feed. Most of these pasture mixtures advertised by the seedsmen in their catalogues have been tried by us and we have practically rejected them all, and are now confining ourselves to the Guelph Agricultural College mixture and our own. There is not a wide difference between these two mixtures. The yield is about the same, and the price is about the same—perhaps there is the difference of a few cents in favor of the Ottawa combination. In fact they are very much the same, after all, and they give to the farmers of Canada an excellent pasture, which it will pay them to grow. With our mixture you can get two crops of hay, after which it can be put out to pasture for a few years. Our mixture for permanent pasture is as follows : 6 lbs. of timothy, 4 lbs.

meadow fescue, 2 lbs. orchard grass, 1 lb. Kentucky blue grass, 1 lb. mammoth red clover, 1 lb. common red clover, 2 lbs. alsike, 2 lbs. lucerne, 2 lbs. white Dutch clover, and on wet land 1 lb. of red top is added.

The Kentucky blue grass is really the same as our June grass. I believe that June grass will grow in any part of Ontario except in the Arctic region. It is a native grass. You will have noticed it spreading along the road side ; it has such a rich, green sward. This grass is to be used for the bottom of the pasture, as the other grasses are higher growing plants. Kentucky blue grass is particularly good for milch cows. It does not do well on low-lying land, however, and on such places I would advise you to grow red top. The red top I refer to is that low, feathery variety that flowers about the same time as June grass. It is bluish-green in color and will even grow out of the water. It should never be omitted from any pasture mixture.

Lucerne is a valuable clover, yet it is a little fastidious in regard to locality, and there are some districts where it does not appear to do well. I have seen places where the simple dividing line of the road made a wonderful difference in the appearance of two fields. It will not thrive on damp land. It is a clover that demands certain conditions, else it will not pay a man to grow it. If, however, it grows well with you, it is a most valuable plant, for it has all the advantages of a nitrogen gatherer, and it is also a splendid fodder for the stock. The Guelph mixture has rather more lucerne than ours, and for light deep soils it is perhaps the better mixture.

I would also recommend alsike, which will give you more than you will get from the common red clover, and I would not fail to add some white top, or what is called white clover. Some people say that white clover will salivate horses, but I do not think so. I know that it will make an excellent bottom for permanent pastures, and it adds greatly to the value of the mixture. Alsike is a low land clover, and it is not injured by the clover seed midge. However, it is not so easily saved as the other clovers.

Mr. Dewhurst: Would you recommend alsike as a food for dairy cows? Does it not add an undesirable flavor ?

Dr. Fletcher : I have had that question asked at several conventions, and I think that it is not one that really needs to be considered. At London four or five years ago they had the matter fully threshed out, and at the end it was still undecided. There were about as many on the one side as on the other. Alsike will sometimes scour an animal when fed too fully at first ; and while this condition lasts the milk may be flavored a little.

Mr. Sprung : My experience has gone to show that there was a serious injury to the flavor of milk by allowing the cows to feed on alsike. We had a number of cases of bad flavor in our factory, and in every instance it was traced to the alsike.

Mr. Forster : I have found objectionable flavors where cows were fed on common red clover. It lasts for a few days.

Dr. Fletcher : Just so ; but you would not drop red clover on that account; nor can I see why you should drop alsike either. However, if the maker believes that alsike injures the flavor of milk he should advise against its use.

Orchard grass is one of the favorite grasses in Europe, and does well in Ireland. It is a very succulent, and is a wonderfully quick grower. It is not unusual for it to spring up two or three inches in a single night after a good rain in favorable weather. It is earlier than timothy, but does not give so large a yield. One drawback to this grass is that it is apt to grow in tussocks or clumps if thickly seeded, and cattle will not eat it so freely then, or when its gets older, and is apt to become dry and tough. Keep it well fed down.

I believe that the common red clover is the most profitable crop we have. It will give a staple crop wherever grown, year after year. It should be in every mixture for permanent pasture.

Meadow fescue also gave us good results. It gave a good crop of grass, and makes excellent hay. It should be in every mixture, and will do well on rich lands especially.

Smooth meadow grass, June grass, and Kentucky blue grass are practically one and the same grass. As I have before stated, this is one of the most nutritious grasses

that we have. This grass should be cut when in flower in order to get the best results. We have been despising this grass in the past, although it is a most valuable variety. The particular June grass I refer to is the flat-stemmed June grass. The stem does not turn white until late in the season.

Foul meadow grass is most suitable for low, swampy land. Although not usually recognized as an agricultural grass, it is worthy of a trial. The Indians value it for its fine, soft quality.

Awnless Brome grass is one that demands some attention. If the Dominion Experimental Farms have done nothing else but introduce that grass into the Northwest that one thing would justify their existence. It is a very coarse looking grass, but it has the power of developing itself on otherwise uninviting soil, and it is now being grown on thousands of acres of semi-arid land where otherwise nothing would be growing to-day. It has also the characteristic of holding its nutritive quality. When it throws out its seed stem it also sends out five or six supplementary stems. This grass may be left until the seed ripens, and owing to the richness of the seed remaining in it still be worth as much for fodder purposes as if cut earlier. It is not so well suited for Ontario, because it has an underground stem like quack grass, or scutch grass, as we often call it. But do not be afraid of even quack grass. Look at it, and see what it is. It runs a lot of roots under the ground ; but they are not very deep—about four inches. See that these are turned up so as to be on top. The plant drinks with its roots, and breathes with its leaves, and if you will keep the roots exposed to the air you will starve and smother the plants and get rid of them. Shallow plowing is best. I have a plot of Brome grass at the Experimental Farm that never spreads beyond the dividing line. I would not be afraid to grow quack grass. In fact it is a very good food for live stock. The trouble is that it is so greedy that it chokes itself out. Simply treat quack grass in the right way at the right time, and you can easily get rid of it. Do not plow too deep. Turn up the roots to the air. This is the best way to get rid of weeds of any kind.

The President : A friend of mine, an Irishman, told me that he pulled up quack grass with his hands and burned it, and that quack grass grew from the ashes. (Laughter.)

Dr. Fletcher : The best way is to starve it out. And even if you let it run its way it will choke itself out in a few years. However, Brome grass will give more trouble than quack grass. I find, though, that the people who object most to Brome grass are those who have never tried it. It is giving large stores of food for live stock in the Northwest and in the Territories where the native grasses have died out. It is producing four tons of cured hay under irrigation near Calgary. Mr. Peterson, Deputy Minister of Agriculture for the Northwest Territories, last year received $400 for the product of eight acres of Brome grass in seed and hay. You can therefore see how useful it is in that part of the country. Of course it is not so suitable for Ontario conditions.

Indian corn is one of the very best grasses—for it is a grass—that the farmer can pay attention to, for it will give an average yield of fifteen tons to the acre. But where corn cannot be grown to satisfaction some of the millets may be raised. If you want a cleaning crop you can wait right up to the middle of July, and then put in millet. Its seeds will germinate with the smallest amount of soil moisture, and will give you a good crop of hay. But millet is injurious to stock if allowed to get too old when cut or fed. The best time to cut millet for seed is just when the flower is dropping. It will make good feed, and it will clean the land.

A worn-out pasture does not mean that the land is used up, but it means that some of these free-growing grasses have developed so many roots that a change is necessary. Of the other 400 grasses grown in Canada there are many which have useful purposes, but which I have not time to name now. Some are suited for wet land, while others are better suited for high, dry soils.

A Member : What about red clover for the silo ?

Dr. Fletcher: Mr. Grisdale says that he has put red clover in the silo, and that it has given him more satisfaction than ever. For green fodder it will pay every man engaged in dairying to sow peas, oats and barley in the proportion of one bushel of each to the acre, as a protection against summer drouth.

CONDITIONS AFFECTING THE CURING OF CHEESE.

By Prof. Van Slyke, Geneva, N.Y.

During the past five years the subject of cheese-curing has been very extensively discussed in its practical relations. You have recognized the importance of this portion of the process of cheese-making, and your dairy leaders have contributed much to the solution of the problem on its practical side. Dr. Babcock and Dr. Russell have led in the study of the scientific side of the problem, ascertaining some of the changes produced in cheese under various conditions of curing.

For nearly three years we have been working on some phases of the cheese-curing problem at the New York Agricultural Experiment Station at Geneva. Without going into details, I would state that we have six separate curing rooms, in each of which the temperature can be held at practically any fixed degree desired, anywhere within a range of 50 degrees, between 40 and 90 degrees F.

Moisture is more difficult to control. We aim to keep this as nearly as possible at 75 per cent. of saturation, but variations of ten per cent. are liable to occur at times.

I have not come here for the purpose of giving you any new practical information in regard to methods of controlling temperature and moisture in curing rooms. As a matter of fact, you Canadian cheese-makers are far ahead of those in New York in the extent to which you have made use of improved curing rooms, under the instruction and stimulation of Prof. Robertson, Prof. Dean, Mr. Ruddick, and others. I shall not touch at all upon the construction of cheese-curing rooms. My chief purpose is to present facts, which will, I hope, serve to emphasize the importance of giving attention to the conditions in cheese-curing rooms. I cannot promise you facts very different, in the main, from those previously known to you. Rather, I presume that the most of value that I can do is to furnish added facts, confirming results already secured. We have been able to work under conditions more completely under control, perhaps, than have others.

Now, I want to say at the outset that I am not a cheesemaker, practical or otherwise. If I were told that I must choose between making a cheese and being shot I should try to make the cheese. If I succeeded in making something really good, no one could be more surprised and pleased than myself; but I fear that if I were to make a cheese under these conditions I should be shot anyway, and the product of my manufacture would probably be used for ammunition. I profess to be only a student of dairy chemistry, and more particularly cheese chemistry; the results I have to lay before you are, therefore, more or less largely chemical results.

I shall consider with you the conditions affecting cheese-curing under three general heads:

1. Those affecting loss of weight.
2. Those affecting chemical changes in cheese.
3. Those affecting commercial quality.

In thus dividing the subject for presentation I would not be understood as implying that the conditions which influence the various changes indicated are distinct from one another. As a matter of fact, we shall see certain fundamental conditions underlying and affecting all the results we find in the ripened product.

Loss of Moisture in Cheese Curing.

The loss of weight in cheese during the process of curing under proper conditions may be regarded, for practical purposes, as being due entirely to the evaporation of water from the cheese. Of course the mechanical loss of fat by exudation from cheese, when the temperature is allowed to go too high, is a matter for serious consideration; but we are now assuming that such a condition should not be allowed to occur, and it will not, with a proper control of temperature. In my own observation, there is danger of some loss of fat even at 75 degrees F., provided this temperature is maintained steadily for some weeks. The loss increases rapidly above 80 degrees F. There may be a very slight loss in weight due to formation and escape of carbon dioxide or other gases from cheese, but these can be neglected for the purpose we have in view.

The rapidity and extent of loss of water in cheese-curing vary with several conditions, chief of which are the following:

1. The amount of water originally present in the cheese.
2. The temperature of the curing room.
3. The size and shape of the cheese.
4. The proportion of water-vapor present in the air of the curing room.

The results to which your attention will be called are based upon averages secured under the special conditions employed, these being temperatures of 55, 60, 65, 70, 75 and 80 degrees F., with a moisture content varying from 65 to 80 per cent. of saturation and averaging about 75 per cent.

For the sake of ready comprehension and comparison, the figures presented express results for 100 pounds of cheese, unless otherwise stated, and are given in round numbers.

The Amount and Rate of Loss of Moisture as Influenced by the Amount of Water Originally Present in the Cheese.

In the following table we show the amount of water present in the green cheese and amount lost per 100 pounds of cheese for each of four weeks, under uniform conditions of moisture and temperature:

Pounds water in 100 lbs. green cheese.	Pounds water lost by 100 lbs. cheese.			
	In 1 week.	In 2 weeks.	In 3 weeks.	In 4 weeks.
55	9.00	11.15	12.25	16.75
45	4.45	6.30	8.00	9.45
35	3.30	4.20	4.90	5.70

These figures show a general and marked tendency for very moist cheese to lose water more rapidly than cheese having less moisture, other conditions being uniform. The cheese having 55 per cent. of moisture at the start lost about three times as much each week as did cheese having 20 per cent. less water, and not quite twice as much as the cheese having 10 per cent. less of moisture at the start.

As the moist cheese loses water much more rapidly in proportion, the moisture in the different cheese tends to become more nearly alike; but, so far as our observations go, they would not all reach the same condition of water-content, except under very unusual conditions.

These cases are extreme, and may, perhaps, have no practical application in your experience, but there is a practical question in this connection to be considered later.

The Influence of Temperature upon the Amount and Rate of Loss of Moisture in Cheese.

We will first look at some results which were obtained with cheese 15 inches in diameter, weighing about 65 lbs. when taken from the press and containing about 37 per cent. of water. This is the most common type of cheddar cheese made in New York, and I presume the same is true with you. The figures given represent the amount of water lost for 100 lbs. of cheese :

Temp. of curing room.	Pounds of water lost for 100 lbs. of cheese.						
	In 1 week.	In 2 weeks.	In 3 weeks.	In 4 weeks.	In 8 weeks.	In 12 weeks.	In 16 weeks.
°F.							
55	1.6	2.6	3.2	3.7	5.2	6.1	6.7
60	1.7	2.7	3.3	3.9	5.5	6.4	7.0
65	1.9	2.9	3.5	4.1	5.8	6.8	7.6
70	2.0	3.1	3.7	4.3	6.1	7.8	9.0
75	2.2	3.3	4.0	4.7	7.2	9.7	11.4
80	2.4	3.7	4.5	5.2	8.3	11.6	15.5

We notice the following points :

1st. The total loss of moisture is greater the first week, and also every following week at a temperature of 80 degrees than at lower temperatures. The loss increases with increase of temperature.

2nd. The average weekly loss or rate of loss increases with increase of temperature, as is shown by this table :

Temperature.	Average loss per week.				Total loss for 4 months.
	1st month.	2nd month.	3rd month.	4th month.	
°F.	ozs.	ozs.	ozs.	ozs.	lbs.
55	$14\frac{3}{4}$	6	$3\frac{1}{2}$	$2\frac{1}{2}$	6.7
60	$15\frac{1}{2}$	$6\frac{1}{2}$	$3\frac{1}{2}$	$2\frac{1}{2}$	7.0
65	$16\frac{1}{2}$	$6\frac{3}{4}$	4	3	7.6
70	17	$7\frac{1}{4}$	6	$4\frac{3}{4}$	9.0
75	$18\frac{3}{4}$	10	10	$6\frac{3}{4}$	11.4
80	$20\frac{3}{4}$	$12\frac{1}{2}$	13	$15\frac{1}{2}$	15.5

The extra large loss at 75 and 80 degrees F. was caused by leakage of fat.

3d. The loss of weight is greater during the first than during any week following, being nearly as great as the total loss during the tow or three weeks following, all put together. This comparatively rapid loss of moisture during the first week is in part due to the fact that the bandage holds considerable water, and this quickly dries. Then, too, the outer surface of the cheese, in drying, begins to harden the pores of the cloth, also filling the pores to some extent, and this tends constantly more and more to diminish evaporation, provided cracking is prevented. Mainly, however, the rapid loss of moisture at the start is due to the fact that the moisture is highest then.

Influence of Size of Cheese Upon Loss of Moisture.

We present data showing the comparative losses of moisture in cheese of different diameters and of approximately equal height. To illustrate the point it is sufficient to present results with only two different temperatures :

Diameter of Cheese.	Temperature of curing room.	Pounds of water lost for 100 lbs. of cheese.						
		In 1 week.	In 2 weeks.	In 3 weeks.	In 4 weeks.	In 8 weeks.	In 12 weeks.	In 16 weeks.
Inches.	°F.							
15	55	1.6	2.6	3.2	3.7	5.2	6.1	6.7
11	55	2.1	3.6	4.2	4.6	6.4	7.4	8.8
7	55	2.2	3.6	4.3	5.1	7.2	8.8	9.8
15	70	2.0	3.1	3.7	4.3	6.0	7.8	9.0
11	70	2.5	4.2	4.7	5.2	7.4	8 8	10.3
7	70	2.9	4.5	5.5	6.2	8.9	10.9	12.2

In the following table we give the results found in case of cheese having the same diameter, but varying in height. The diameter was 7 inches in these cases. The cheeses were cured at the same temperature (60 degrees F.) :

Height of Cheese.	Pounds of water lost for 100 lbs. of cheese.							
	In 1 week.	In 2 weeks.	In 3 weeks.	In 4 weeks.	In 8 weeks.	In 12 weeks.	In 16 weeks.	In 20 weeks.
Inches.								
3	3.4	5.3	6.4	7.0	10.7	12.9	13.9	14.9
5	2.8	4.2	5.5	6.7	8.3	9.8	11.2	12.6
7	2.3	3.4	4.7	5.6	7.4	8.9	10.5	11.2

These results all go to show that increase in size of cheese is accompanied by relative decrease in loss of moisture during curing. We should expect this, because usually increase in size means diminution of outer surface exposed for evaporation relative to weight.

Influence of Moisture in Air Upon Loss of Moisture in Cheese.

The relative amount of moisture in air, or, more properly, the degree of saturation, probably exercises a more marked influence upon loss of water in cheese-curing than any other single factor. I will present a single illustration, representing two cheese, one cured in an atmosphere containing moisture equal to about 75 per cent. of saturation, and the other cured in an atmosphere completely staurated with moisture, the temperature in both cases being 60 degrees F.

—	Pounds of water in 100 lbs. of cheese.					
	2 wks.	1 mo.	2 mo.	6 mo.	12 mo.	15 mo.
75 per cent. saturation ..	36.00	35.2	34.9	31.9	26.3	24.9
Saturated	35.90	35.9	36.0	37.0	37.6	37.9

In the case of the cheese kept in a fairly moist atmosphere, the loss of moisture was considerable, amounting at the end of 15 months to about 11 lbs. per hundred pounds

of cheese. I the cheese kept in a saturated atmosphere there was a gradual absorption and actual increase of moisture. At the end of 15 months the moisture had increased 2 per cent. For every 100 pounds of green cheese we started with we had 102 pounds at the end of the experiment, the increase being due to absorption of water.

Some Practical Applications.

The results which have been thus far presented suggest some practical applications, to which your attention will now be briefly called.

1st. To the cheese-maker and the dairyman water is money when put in the right place in right quantities. It is essential, first, to put water into cheese in such proportions as may be best, and, second, to keep it there with the least possible loss.

The actual amount of water that cheese should contain hardly lies within the scope of my subject, but it may be of interest to state that in New York State the moisture in green cheese usually amounts to 36 to 37½ per cent. ; this is for regular cheddar cheese. For home-trade cheese, so called, made in the fall, the moisture more often lies between 38 and 40 per cent. It is safe to say that, for an average cheese-eater in the States, a moisture content of not less than 33 to 35 per cent. at the time of consumption is desirable.

From the dairyman's standpoint, it is desirable to sell as much water in cheese as will suit the consumer. Taking everything into consideration, I believe better results will be secured in quality by holding less moisture in the green cheese and curing it under such conditions that it will lose only a small amount of water, rather than by holding a larger amount of moisture in the green cheese and so curing that a larger amount of moisture is lost.

There are some cases in which cheese-makers plan to put 40 per cent. or more of moisture into the green cheese, in the expectation that 10 lbs. will be lost in curing. They probably have conditions such that their expectations are fully realized. I cannot believe that a product so made and cured will command much respect in the market.

2nd. The more completely a cheese dries the harder and thicker is the rind and the greater the loss to the consumer. Most people plan to throw away a rather thick rind. In a carefully cured cheese the rind is comparatively moist very near the surface, and only a very thin portion need be lost, and even this can be utilized in cooking.

3d. In preventing excessive loss of moisture, we have more water to sell at cheese prices. From inquiries made among our New York cheese factorymen, I find that under conditions more favorable than the average, the usual loss of weight during thirty days amounts to five pounds per 100 pounds of cheese. The amount is probably somewhat higher in the majority of our factories. In order to escape some of this loss, some factories try to get rid of their cheese when two or three weeks old. I believe this loss could easily be reduced by 1½ to 2½ lbs., and there could be for every 100 lbs. of cheese that much more water to sell at cheese prices. This would mean a gain of two to four hundred dollars a season for an average factory. While such saving may seem slight, it should not be treated with contempt.

4th. In making small cheese, like Young Americas, or thin cheese, like "flats," the proportion of loss is much greater, and hence the demand is still more imperative that these shall be cured under conditions where the loss of moisture shall be reduced to a minimum.

These statements do not apply in the case of small fancy kinds of soft cheese, because in curing them an essential part of the equipment consists of curing cellars of fairly low temperature and high moisture content.

Conditions Affecting Chemical Changes Taking Place in the Ripening of Cheese.

The change we have been considering, loss of water, is mechanical ; that is, it is not the result or cause of chemical change in anything. The water is in the cheese as

water, as part of a mixture ; it simply comes out as water in form of vapor. But from the moment a cheese is put in press, or even earlier, the rubbery, tough, insoluble casein begins to change into something else, or rather into a lot of other things, each of which is very different in character from the green-cheese casein.

We need not consider fat in this connection, as in ordinary cheese-ripening fat undergoes little or no change.

The profound changes seen in cheese-casein are brought about mainly, if not wholly, by certain chemical substances or ferments called enzymes. One of the striking characteristics of this class of ferments is that a small quantity accomplishes an immense amount of work. While enzymes are the product of living cells, they are not themselves living organisms, but simply chemical compounds without life, yet capable of producing changes in various materials.

So far as our present knowledge goes, there is reason to believe that the enzymes which cause cheese-casein to change or ripen come from three sources: (1st) Galactase, the enzyme in milk discovered by Babcock and Russell. (2nd) Enzymes produced by bacterial action in the udder, and (3rd) the pepsin contained in rennet. What proportion of the work is done by each kind of enzyme we cannot at present say. It is probable, however, that the pepsin of rennet plays a larger part than has previously been assigned it, as an investigation at our station, not yet completed, appears to indicate. Time does not permit me to dwell in any detail upon this feature, important and interesting as it is. Nor shall I tax your patience by any detailed consideration of the various kinds of nitrogen compounds into which cheese-casein is changed.

For the purpose of this occasion, we will consider only the general change from cheese casein insoluble in water into casein derived compounds soluble in water. These water-soluble compounds, made from casein, by enzyme action, are more readily digestible than the unchanged green-cheese casein. The exact relation between digestibility and water-solubility in the case of these specific substances has not been ascertained, so far as I know. But it is a matter of common and universal experience that well-cured cheese is more easily taken care of in the human stomach than is green or imperfectly cured cheese. It is fairly accurate to say that cheese-ripening consists of the breaking down of insoluble cheese-casein into soluble nitrogen compounds, because this is the chief kind of chemical change that occurs, and it is this change that so materially affects some of the most important commercial qualities of cheese. So far as we have any accurate available means for measuring the degree of cheese-ripening, the extent of change in cheese-casein affords the only satisfactory basis of such measurement.

And, at this point, I would refer to another important effect of cheese ripening, the development of flavor. Is this the result of bacterial action ? Or is it the result of enzyme action ? Is flavor formed as a part of the action by which cheese-casein is made soluble ? Or is it the result of some quite different action? Is flavor associated with the changes in fat-compounds, and in no way connected with casein changes ? So far as I know, these questions cannot be answered satisfactorily at present. We make use of flavor as a rough means, in part, of determining the degree of ripeness of cheese, more particularly from a market standpoint, but we cannot use it as an accurate basis by which to determine the extent of ripening with reference to changes in cheese-casein. The flavors of cheese are not mysterious, intangible ghosts; they are due to some special chemical compounds formed in the cheese, by enzyme or bacterial action; in other words, they are specific substances having taste and odor. They are formed after the cheese-casein has undergone some change. They are present in very minute quantities, and on this account are difficult to separate and identify, but before many years we shall know what they are, where they come from and under what conditions they are formed. Then we can hope to control them more effectually.

A variety of conditions appear to affect the rate of cheese ripening, among which we may mention the following : 1, Temperature ; 2, moisture ; 3, salt ; 4, rennet ; 5, acid.

Influence of Temperature Upon Cheese Ripening.

I will first call your attention to some 65-pound cheddar cheese, which were ripened at temperatures varying from 55 degrees to 80 degrees F. The figures in the table represent the number of pounds of nitrogen in soluble form for each hundred pounds of nitrogen present in the cheese:

Temp. of curing room	Pounds of soluble nitrogen formed for 100 lbs. of nitrogen in cheese.					
	In 1 mo.	In 3 mo.	In 6 mo.	In 9 mo.	In 12 mo.	In 18 mo.
° F.						
55	16.4	29.3	36.2	39.7	39.7	40.0
60	18.5	33.3	41.1	43.4	44.3	45.0
65	20.9	33.5	41.3	44.5	45.6	46 4
70	21.6	34.0	43.8	45.9	46.8	51 8
75	22.7	37.1	47.1	48.7	50.8	52.5
80	23.4	38.5	49 6	51 6	53.2	54 9

Your attention is directed to the following points of interest:

1. Cheese ripens more rapidly with increase of temperature.

2. Cheese ripens more rapidly in the early period of the process. For illustration, take the cheese at 65 degrees in the table. During the first month the average weekly amount of ripening was 5.2 per cent.; during the second and third months it was 1.6 per cent.; during the next three months it was 0.6 per cent., and it diminished steadily.

Why does cheese ripen so much more rapidly in the early stages? I can suggest only one explanation. The action of enzymes is weakened by the products of their own making. The soluble nitrogen compounds formed from casein by enzymes appear to have the power of checking or paralyzing the activity and affectiveness of the ferment. As these products accumulate in greater proportion, the rapidity of the ferment action slackens.

Influence of Moisture Upon the Ripening of Cheese.

For over two years we have been studying this question: Does the amount of moisture present in a cheese influence the rapidity of ripening, as measured by the formation of soluble compounds from cheese-casein? In order to control the moisture, we have employed two methods. First, we have covered the green cheese with melted paraffin, so that the loss of moisture was greatly reduced, and, as previously stated, we have kept cheese in an atmosphere saturated with moisture. We have made many such comparisons, and we find practically, without exception, that ripening proceeded more rapidly when the water contents of cheese was kept higher. For illustration, I will give you a single set of comparisons, in which we used three cheese, one cured on the shelf in the normal way, one covered with paraffin, and one kept in an atmosphere saturated with moisture:

——	Per cent. water in cheese, in 15 mos.	Pounds of soluble nitrogen formed for 100 lbs. of nitrogen in cheese.				
		In 1 mo.	In 2 mo.	In 6 mo.	In 12 mo.	In 15 mo.
Normal	24.85	22.5	29.1	37.7	41.3	42.7
Covered with paraffine	28.10	23.3	29.4	41.8	44.9	48.1
Air sat'd with moisture	37.85	23.4	31.2	47.0	56.2	64.7

1. The three cheese had the same per cent. of water at the start, which was 36 per cent. These figures indicate that moisture in cheese is a very prominent factor in promoting the ripening of cheese.

2. Our extended study appears to justify the statement that, when the moisture in cheese drops to 30 per cent., the ripening process is greatly retarded, and that when the moisture drops below 25 per cent., the ripening practically ceases.

3. In general, we have found that any condition which retards the loss of moisture in cheese favors more rapid ripening, other conditions being the same. Thus, large cheese cure somewhat more quickly than small ones, as a rule.

This favorable action of increased moisture towards the ripening process of cheese may be explained on the general ground that enzyme action is promoted by moisture above a certain point. This favorable effect may come from the fact that the presence of the more abundant moisture prevents the concentration of enzyme products, the concentration of such products being unfavorable to continued enzyme action. It is also probable that moisture favors the growth of enzyme-forming bacteria in cheese.

Influence of Rennet Upon Cheese Ripening.

Rennet contains more or less of the well-known enzyme we call pepsin. Pepsin has the power of making cheese-casein soluble, especially in the presence of a small amount of acid. Babcock and Russell have shown that increased amounts of rennet in cheese-making increases the rapidity of the ripening process. Some work that we did several years ago pointed to such results, and more recent work confirms them.

We now have under way some investigation work for the purpose of showing to what extent rennet pepsin alone will ripen cheese. The work has not gone far enough to enable me to make any positive statement, but the indications are that some definite change is produced, and of some considerable extent.

In this connection it may be of interest to suggest that, in the use of starters in cheese-making for the purpose of developing lactic acid, we may be introducing an agent that favors the more rapid action of rennet-pepsin in cheese-ripening, because small amounts of this acid favor the action of pepsin. We have under way some specific work designed to show to what extent this is true.

Influence of Salt in Cheese Upon Cheese Ripening.

It has been known in a general way among cheesemakers that the excessive use of salt in cheese-making retards or prevents ripening. We have had under way some months work planned to show in a more exact manner to what extent the presence of salt retards ripening. I present a few results taken when the cheese was three months old, cured at 70 degrees F.:

Salt used per 100 lbs. milk.	Per cent. salt in cheese.	Per cent. water in cheese.	Soluble nitrogen.
....	....	37.2	46.5
1½ lbs.	.77	34.6	41.0
2½ "	1.15	33.2	38.4
5 "	1.62	31.9	34.5

Attention is called to the following points of interest:

1. The amount of moisture in cheese decreased with increase of salt.

2. The amount of soluble nitrogen, that is, the extent of ripening, decreased with increase of salt. The cheese containing no salt had ripened about one-fourth more than the cheese containing most salt.

3. The amount of salt retained in cheese was not proportional to the salt used. A larger proportion of the salt used was held in the cheese, when the smaller amounts of salt were used.

The amount of salt normally used in cheese appears to retard enzyme action, that is, cheese ripening. Salt does this, regardless of other conditions; but its action is emphasized, because increase of salt decreases moisture.

Conditions of Cheese-Curing Affecting Commercial Quality.

A practical cheese-maker may think at this point that the data thus far presented have a certain kind of interest, but he may be inclined to ask, like our politicians in the States, what there is in it for him, or where he comes in ? In other words, what relation have the facts presented to the commercial quality or market value of cheese? How is commercial quality affected by increase or decrease of temperature and moisture? Is a rapid ripening of cheese something desirable?

As a basis for some specific statements. I wish to call your attention to some data secured at the Geneva Station over a year ago. The data, however, are simply confirmatory of those you have obtained here. The only difference is the range. The cheese used in this work were shipped to New York and scored by an expert, who knew nothing of the conditions of curing or what our station was after. The results are given in the subjoined table:

——	Temp. cured.	Age of cheese when scored.				Total score at 5 mos.
		1 mo.	2 mo.	3 mo.	5 mo.	
	° F.					
Flavor	80	42	42	39	38	83
Texture	"	21	21	20	20	
Flavor	75	43	43	41	39	84
Texture	"	23	22	20	20	
Flavor	70	45	43	43	42	88
Texture	"	23	22	22	21	
Flavor	65	47	48	44	44	91
Texture	"	24	24	24	22	
Flavor	60	48	49	47	48	97
Texture	"	25	24	24	24	
Flavor	55	45	49	49	50	100
Texture	"	25	24	25	25	

We can summarize the results embodied in this table as follows:

1. The cheese cured at 80 degrees F. gave the lowest scoring every time, and showed steady decline from month to month, getting worse all the while, in both flavor and texture.

2. At the temperatures 80 degrees to 65 degrees inclusive the highest scoring in about every case was when the cheese was one month old. In each succeeding month there was falling off both in flavor and texture.

3. At 60 degrees F. the flavor remained fairly uniform during the whole five months, but the texture fell slightly.

4. At 55 degrees F. the cheese was not ripe enough in one month to score well in flavor, but improved from month to month, and in five months was perfect. The texture remained practically perfect from the start.

5. The rule is for cheese cured at temperatures above 65 degrees F. to acquire a more pronounced flavor, sooner or later becoming more or less sharp, and often developing flavors that are disagreeable and even offensive to cheese consumers. Cheese cured at lower temperatures acquire a mild flavor, improving steadily for months, and containing a uniform flavor for a comparatively long period of time.

6. The influence of temperature upon the texture of cheese is marked. Taking temperature by itself, where the moisture is kept practically constant, we find that higher temperatures tend to produce one or both of two results. In the first place it favors the formation of holes in the cheese; and, second, by the rapid breaking down of the cheese-casein, the cheese becomes rather soft, lacking in solidity of body. Under ordin-

ary conditions of curing, increase of temperature means greater loss of moisture. Marked loss in moisture tends to make cheese become crumbly and mealy to a greater or less extent, increasing with the age of the cheese. It is my judgment that an ordinary cheese will suffer in texture when the moisture drops below 30 per cent., and perhaps the limit is higher than this, often depending upon special conditions of manufacture. Even a cheese made from milk, to which cream had been added (the green cheese containing over 40 per cent. of fat), showed a crumbly texture when the moisture dropped below 30 per cent.

By way of summarizing the facts that have been presented, permit me to direct your attention to the following points:

1. High temperatures cause more rapid curing of cheese, but injure the quality.

(a) High temperatures increase loss of weight through increased evaporation of moisture.

(b) Excessive loss of moisture injures the texture of cheese.

(c) High temperatures and continued high moistures bring about more rapid ripening than with less moisture; but the texture tends to become weak and lacking in solidity, while flavors are produced that suggest putrefactive changes.

2. Low temperatures result in less rapid ripening of cheese. but favor the development of higher quality and longer keeping power.

(a) Low temperatures diminish loss of moisture, and hence loss of weight.

(b) Too little moisture, even at low temperatures, may result in imperfect texture.

(c) Higher moisture than average, even at low temperatures, favors more rapid ripening without impairing flavor or texture.

3. Whatever the moisture content of cheese may be, high temperatures can spoil the cheese; and the higher the moisture the more quickly is the spoiling apt to occur.

4. Even at a steady temperature of 70 degrees F. the quality of cheese is not maintained, compared with a curing temperature of 60 degrees or 55 degrees F., especially after the early stage of ripening.

During June, July and August the temperature in many curing-rooms will average 75 degrees F. or more, and how high it goes at times is limited only by the degree of heat outside and the capacity of the board to absorb and hold heat. Even where the difference of temperature varies so little as 10 or 15 degrees Fahrenheit, we may safely place the commercial difference at a cent a pound after the early stage of curing. This difference means ten dollars a day for every ten thousand pounds of milk made into cheese. Unfavorable climatic conditions are apt to prevail for two or three months at least, and when you have to heat curing-rooms with stoves in spring and fall an ideal condition of curing does not exist in respect either to temperature or moisture.

Higher curing temperatures mean greater loss of moisture, less water to sell at cheese prices, lower quality, less money and less cheese eaten.

5. With cheese cured at lower temperatures, the curing takes place more slowly, to be sure, but the cheese is growing better all the while, and acquires power of long keeping. This condition enables one to hold cheese for higher prices if desired.

I believe that this improvement in quality, made by curing cheese at low tepmeratures, will prove a most important factor in promoting the consumption of cheese.

We may try to persuade people that cheese is a most economical and concentrated form of food; we may talk to them about its digestibility; we may use every possible argument to prove to them that they ought to be more sensible and eat more cheese. But the average cheese eater, as far as I know him, does not want high-flavored, sharp-tasting cheese, and he stops eating it when he cannot find any other kind in the market. Give him a sufficiently moist cheese, well broken down, dissolving easily on the tongue. of mild flavor, and he will eat more. and you will be called upon to make more cheese of the same kind.

I am aware that there is a class of cheese-eaters who want very mild-flavored cheese, and think they can get it only by eating cheese very imperfectly or incompletely ripened. They will take it when three or four weeks old; and I suppose they will insist having cheese upon which they chew hard, that won't dissolve easily in the mouth or

stomach either. This kind of vitiated taste should be overcome, if possible, for it is eating this kind of cheese that has given so many people an exaggerated idea of the terrible demands made by cheese upon the digestive organs. In the long run this class of cheese eaters is hardly worth catering to, for even they are mortal, and they usually become confirmed dyspeptics and stop eating cheese altogether.

A paper on this subject would be seriously incomplete without reference to the results of the work of Dr. Babcock and Dr. Russell, announced about a year ago. Carrying on their investigation at temperatures well down below the freezing point, they found the ripening process successful in respect to quality, but the time required was long. Their work promises to furnish the ideal conditions for curing in respect to reducing the moisture losses and producing cheese of fine quality.

In conclusion, there are now before cheesemakers three general plans or propositions for furnishing proper conditions in respect to curing cheese.

1. One plan contemplates providing in each factory a suitable room where conditions of moisture can be fairly well controlled.

2. By another plan, cheese buyers take the cheese green from the factory and place them in suitable storage. The maker's responsibility ceases soon after he has taken the cheese from press, and the buyer assumes the problem of curing.

3. The third plan was proposed originally, I think, by Dr. Babcock and Dr. Russell some four or five years ago. It is to have buildings located centrally with reference to a number of factories, these buildings being especially erected and equipped fur curing purposes. In this way one curing-house could care for the product of several different factories. Ideal conditions could unquestionably be secured by such a system.

We have seen that the problem of cheese-ripening largely centres about the two conditions of moisture and temperature.

DEVELOPING A DAIRY HERD.

By Prof. H. H. Dean, O. A. C., Guelph.

After some humorous opening remarks the speaker went on to say: I desire to call your attention to what has been accomplished at the Guelph Agricultural College in the way of bringing up the yield of the herd to a better standard than prevails ordinarily. The average yield of nineteen of our milch cows for the last year has been 8,114 pounds of milk, averaging 3,54 per cent. of fat, and giving an equivalent of 326 pounds of butter per cow. One cow gave as high as 11,379 pounds of milk, of 3.34 per cent. milk, or equal to 437 pounds of butter. Our herd of thirty cows all told have brought us in over $1,600 this past year aside from the value of the milk used for raising calves and for experimental purposes in the stable. Now, you will ask me, how have you raised the average yield of your cows over 8,000 pounds of milk? It is important to have good factories, and good makers, and good storehouses, and good ships for carrying our dairy products, but it is first and foremost important that we should have good cows. These cows must be well taken care of, and from these cows the best calves must be taken and carefully reared. I saw a number of cows on my journey between here and Cobourg to-day out in the fields looking for something to eat. They reminded me of the story of the mean old fellow across the line, who scrimped his wife all her life long, and continued his meanness even to the purchase of the tombstone intended to commemorate her virtues. When ordering the tombstone he ordered the narrowest slab that the owner of tombstones had in stock. On this slab he told the maker of monuments to place these words: "Susanna Hackett; Lord, she is thine." The slab was so narrow that the engraver was unable to get the last letter of the last word in the line. Consequently when people visited the graveyard the following Sunday, they saw over the grave of the departed, "Susanna

Hackett; Lord, she is thin." That is very much like some of the cows which I saw in the fields west of Port Hope on my way here to-day. There are too many cows like that all over this country. There is no profit in keeping cows unless they are properly fed.

The second great problem facing the dairymen of the country to-day is how to feed their cows so as to get the very best results. To-day this requires closer study than ever before, owing to the price of feed. We have been buying our own feed to a great extent, and the high prices have compelled us to buy carefully and after much planning. Oats were selling at 45 cents a bushel, peas 70 to 80 cents, and bran and shorts at $19 and $20 a ton. I found after looking up the chemical composition of these various foods that I could save about half a cent on each animal a day by feeding bran and shorts instead of oats and peas. Half a cent a day on each head means considerable where you have a herd of from twenty to thirty cows. Every dairyman must study the question of the nutritive value and the digestibility of the various foods he would give his cows. If he does not bring his intelligence to bear on this phase of his work he will assuredly come behind in the race.

Closely connected with this problem is the raising of the right kind of calves. I expect that in a few years we shall have our herd average 10,000 pounds of milk per cow, or about 400 pounds of butter. But in order to reach that standard we must rear our own heifer calves from the best cows, and train them so that they will turn their food into milk. For this branch of dairying—raising your own calves by a process of careful selection—you will have to receive your skimmilk in the best possible condition. There is nothing better for calves after they are three to four weeks old than skimmilk. After the calf is about six weeks old it is well to add bran and oats to their feed, also hay and roots. We conducted experiments during the past year at Guelph along this very line, reaching from July 4th till nearly the end of September, with six calves. In this experiment new milk was compared with skimmilk, oil cake, bran and oats. The calves ranged from two weeks old to five months, and were chiefly Holsteins and Holstein grades.

Two calves, four and five months old, gained 100 pounds in three weeks on skimmilk, bran and oats, at a cost of 1.87 cents per pound of gain. On skimmilk, bran and oats and oil cake they gained 91 pounds in three weeks, at a cost of $2.68, or 2.94 cents per pound of gain. This shows that the addition of oil cake, while it increased the cost of the ration, did not produce a corresponding increase in live weight. When a calf reaches six weeks or two months old I think that nothing will add to muscle and general weight like bran and oats.

Two other calves, six months and two and a half months old, respectively, were given skimmilk, bran and oats, and gained 73 pounds in three weeks, at a cost of $2.04, or 2.97 cents per pounds of gain. On skimmilk, bran and oats, and oil cake they gained 81 pounds in three weeks, at a cost of $2.68, or 3.31 cents per pound of gain. In this case also the cost per pound of gain was increased by the addition of oil cake.

A calf two weeks old at the beginning of the test was fed 14 pounds of new milk daily for three weeks at a cost of $2.35, or 6.71 cents per pound of gain. It gained 35 pounds in the three weeks. The milk was worth to us 80 cents per 100 pounds. When fed skimmilk, bran, oats and oil cake, it gained 45 pounds in three weeks, at a cost of $1 for feed, or 2.22 per pound of gain. Whole milk is too expensive for calves.

A six-weeks-old calf fed on skimmilk, bran, oats and oil cake, gained 43 pounds in three weeks, at a cost of $1, or 2.32 cents per pound of gain.

The above facts show that those farmers who are feeding whole milk to their calves are doing so at a tremendous cost, while those who will feed warm, sweet skimmilk, with bran and oats, will reduce the cost of a pound of gain by more than one-half. However, for the first three or four weeks of a calf's life it is necessary to feed whole milk in order to make a thrifty animal.

From what I have told you to-day, it will be seen that in order to have the best conditions existing in a herd it is necessary that the skimmilk must be returned in better condition than is usual, or else farmers will have to put in separators and keep the skimmilk at home. In our own creamery we pasteurize the whole milk before it goes into the separator. We run the skimmilk over a water cooler, and it is sent back to the farmers in the summer time cool, and in the winter time warm. We keep our creamery pipes and tanks as clean as we can. I hold that any creameryman who has his skimmilk tank in bad condition is not fit to carry on his business. (Applause.) Skimmilk is one of the most valuable foods that we can feed on the farm; it is good for nearly all classes of live stock. I have just come from the State of Vermont Dairy Convention, where this question has been thoroughly discussed. One shrewd dairyman there gave it as his firm opinion, based on experience, that at the present price of feed he would place the feeding value of good skimmilk at 40 cents a hundred pounds, and not to feed to his calves and pigs only, but to give to his dairy cows also. If creamery men will not send a better quality of skimmilk to their patrons they will most certainly lose their patronage.

In connection with the care of milk for cheese factories and creameries it is necessary that it should be cooled to 60 degrees if possible; certainly it should not be allowed to go over 70 degrees. The producer has this responsibility laid upon him. There is something more than aerating needed. In hot weather it is absolutely necessary to cool the milk. The idea that aeration alone is sufficient is false doctrine. A water cooler, an ice tank, or some means of cooling milk, must be adopted for summer conditions.

We have also been making some experiments in slight variations in the method of making cheese. We have been adding five ounces of rennet to the milk at a temperature of 82 degrees, and three and a third ounces of rennet at a temperature of 86 degrees, the object being to see if we could get an increased yield from the milk. The curd with the larger amount of rennet was cooked at 94 degrees, while the other was cooked at 98 degrees. We found that the use of more rennet and the cooking at the lower temperature, gave an increased yield of cheese, but there was too much acid by the ordinary curing, and the quality was inferior. However, as the increase in weight is equal to about a pound and a quarter of cheese per 1,000 pounds of milk used, and as the quality of the cheese when cured in cold storage was equal to that of the other make, the matter is worth further investigation. I find that over in Vermont they make a pound of cheese from nine pounds of milk. Of course, their cheese is not just like ours; and, besides, their milk is richer.

Regarding the practice of washing curds, advocated by some western makers, I would say that careful experiments made at the College Dairy during the year have shown that the practice should not become general. We found there that washing curds did not improve the quality of the cheese. In some cases we found that the washed curds scored a little higher, and in other cases the unwashed curds scored higher. As the loss in weight by washing averaged a pound for every hundred of curd it is manifest that the washing of curds should be the exception and not the rule. If indiscriminately done it is a pernicious practice.

We have also been making experiments to see if there was any difference in curing cheese in a dark room and in a light room. Briefly, we saw no difference in the quality of the cheese. Some men declare that you must have a light curing-room, but we could see no practical difference. An opinion is one thing, and an accurate fact is another thing. We have too many opinions and not enough accurate facts given us in this dairy business.

As Prof. Harcourt has told you, we have been making an experiment in curing cheese in cold storage. Let me just emphasize the fact that cold storage curing-rooms will prevent the development of some of these bad flavors we have been hearing so much about of late. The sooner the cheese are put into such cool rooms the better.

Over in the United States just now they are struggling with the Grout Bill, or the Oleomargarine Bill. At the present time dairymen are divided as to the amount of tax to place upon this butter imitation, although all are a unit upon taxing it heavily if colored and sold as butter. Let us be glad that we are not confronted with this problem, and that oleo in any form is not permitted to be sold in Canada.

We have yet to learn a good deal about the manufacture of cheese and butter. There are many lines that require close investigation. I believe there is need of a dozen men to just keep on investigating dairy matters in this country. We need half a dozen chemists and bacteriologists devoted to dairy investigation, and another half dozen practical makers and dairy students in the highest sense of the word.

PROBLEMS IN AGRICULTURE.

By C. C. James, Deputy Minister of Agriculture, Toronto.

We are standing in a dangerous position to-day. We have made great advancement, but there is a common belief that we have accomplished more than really has been accomplished. When a man comes to think he controls the situation he is in serious danger of sitting down and giving an opportunity to somebody else to step in ahead of him. That is just about our position at the present time.

We have too much at stake to continue in that attitude. Do you ever realize how important the agricultural industry of this Province is? The amount of money invested in this industry in Ontario is about one billion dollars.

Much greater progress has been made in the solution of problems in connection with manufacturing enterprises than has been made in connection with agriculture. Go into any of our great factories to-day and you will not find the piles of waste material which were formerly found there. What was once waste material is now turned into what are called by-products, and these products have become a means of revenue. It was recently shown, in connection with an investigation at Washington, that the beef from a steer killed in Chicago sells for less than the animal costs on the hoof. The profit in turning that steer into beef is all made out of the by-products

How is it in dairying and in agriculture generally ? Has the same care been taken to avoid waste in these lines that is shown in manufacturing enterprises ? I believe there is more waste in connection with agriculture to-day, even in the most progressive countries, than there is in connection with all manufacturing industries combined. How to make profit of what is now waste material in connection with agriculture is one of the greatest problems awaiting solution to-day.

Take the case of converting wood into paper. You see a pile of wood on the one hand, and on the other a pile of paper. There is not much difference between the material in the one case and in the other. But a great number of problems of the most intricate nature were solved before the work of changing the raw material in the form of wood into the finished product in the form of paper could be carried out.

Something similar is found in the case of wheat and flour. There are nearly the same materials in the one as in the other ; but before wheat could be changed into flour by modern processes there were innumerable problems to be solved.

Take a handful of soil and a handful of wheat. These are entirely different in one respect, and yet the one was produced by the other. What problems are there not to be solved in connection with this transformation ?

In the air of this room are all the elements which go to the making of a pound of butter. Is there anyone who can solve the problem of how this air is transferred into such a commodity ? Yet that work is done, in dairying, by mysterious processes of which we know comparatively little. There is here one subject alone which should interest the most advanced experimenters which the world contains.

Problems of the Soil.

Are there not, too, problems connected with the soil ? Why is one soil fertile and another not ? There are very few soils so poor that they contain no plant food whatever. There are very few soils which, under favorable weather conditions, will not grow a crop of some kind. It is not alone the question of food in the soil, but how to make the food available for the nutriment of the plant. Human beings are particular as to the sort of food used for the nutrition of their bodies, and plants are equally particular in regard to this same matter. We know something of the use of ferments in preparing this plant food for the plant. We know the conditions under which these ferments will work ; we know that the ground must be underdrained and that the air must get in. But the lesson is yet to be learned of how to make ordinary ground produce extraordinary crops.

Problems in Plant Growing.

Let me illustrate what may be done along this line. The average production of fall wheat in this Province in a good year is 20 to 25 bushels to the acre. On the experimental plots at the Agricultural College a yield of 40, 45, 50, and even 55 bushels to the acre has been obtained. In one case as high as 56 bushels were obtained. How was this obtained ? By selecting every seed and putting it into the ground under the most favorable conditions. In some countries the yield is down to 7, 8, and 9 bushels to the acre. In the Old Country a better yield is obtained than is secured here. Is there no waste here ? Are there not many problems to be solved before we shall make our fields give the maximum yield ?

To Develop New Varieties.

There is something more than the matter of yield to be looked to. The fall wheat which gave the biggest yield at the College is objected to by the millers because they say it will not make the best flour. Here is another problem to be solved. We must get a wheat which will give us a large crop ; which will mill readily ; stand up well ; which is not subject to rust, and will give us a good bread. There are five requirements which the ideal wheat should possess, and there is no variety to-day which possesses all these requirements.

If I could place on this table one handful of wheat having all the requirements I have just named, every grain of that wheat would be worth $1,000,000, because we could soon increase the supply, and, by growing this improved wheat all over Canada we would revolutionize our production in that line, and Canada could feed the world."

As we open up this question we find that there are problems upon problems to be solved; that, in fact, we have only begun to find out what these problems are. Very few plants produce their maximum to-day. Our fruits are standing waiting for the hand of the improver. In fact, the whole field of nature is open to him. Better field plants, better garden plants, and better production of the orchard are all called for. The man who can bring about improvement along all these lines will perform a service of untold value to mankind.

Problems in Animal Life.

It is not only in plant life that problems are waiting solution. Like problems are found in connection with animal life. In fact, the problems here are of a higher nature than in connection with plant production. We know that a cow can, by her mysterious mechanism, transform oats, bran, and hay into milk—but we are almost entirely ignorant of the methods by which this transformation is brought about.

Our people have not even acquired the lesson of how to produce the most from the cow. The average milk product of the cows of Ontario is 4,000 lbs. per annum. There are 900,000 cows on the farms of Ontario. If we could increase the average produc-

tion of these cows by even 3,000 lbs., and that is easily within range of possibility, just see what an enormous increase it would be to the wealth of Ontario.

See how much has already been gained by the solution of problems along similar lines. You remember the old-fashioned hog in which there was the maximum of fat and the minimum of lean. If we were raising a like kind of hog to-day we could not sell a single pound of our bacon in the English market. But by changing that hog into the bacon type we have within ten years built up an export trade in bacon which amounted to nearly $12,000,000 in the fiscal year of 1901. But for the dairy cow and the bacon hog there would not have been so much money to spend last Christmas in this Province.

Let me give you a few figures to show what the animal products of Ontario and of Canada amount to.

The hog products of Ontario farms increased from $8,776,000 in 1892 to $15,801,000 in 1900.

The exports of bacon from Canada were as follows :—

1894	27,000,000 lbs.	1898	77,000,000 lbs.
1895	38,000,000 "	1899	112,000,000 "
1896	47,000,000 "	1900	132,000,000 "
1897	60,000,000 "	1901	103,000,000 "

Exports of Canadian animal products (beef, mutton, bacon, butter, cheese, etc.) :

	1871.	1901.
Meats	$1,912,062	$13,690,904
Butter	3,065,234	3,295,663
Cheese	1,109,906	20,696,951
Eggs	424,033	1,691,640
Total	$6,511,235	$39,375,158

Transportation and Preservation Problems.

There is not only the matter of production, but there is the matter of transportation as well. The transportation problem was a simple one when it consisted largely in floating timber down the rivers to the sea, or in shipping wheat. Something better was demanded when we began shipping live stock. A very different problem confronts us to-day when we are producing a fine quality of perishable fruits, dairy products, etc. How to preserve these products during transit, and to land them in the ultimate market in the best possible condition is one of the greatest problems receiving careful attention in connection with modern agriculture.

A Man Wanted.

If I could put my hand on a man who was willing to apply millions to the improvement of the condition of his fellows, I would have him establish the greatest agricultural laboratories in the world, man these with the ablest experts procurable, set them to work upon these problems regardless of their immediate practical application, and I feel sure that every dollar so spent would be returned tenfold to the people of this country.

The greatest man that France produced was not Napoleon, who broke down and destroyed so much, but Pasteur, who built up so much, a man who worked out in his laboratory problems that have blessed mankind, and have added untold wealth not only to France but to every other civilized country. There is work for a dozen Pasteurs in Canada in this great and fascinating field of agricultural science.

SCIENTIFIC TRAINING.

BY PROF. H. H. DEAN, O.A.C., GUELPH.

I am delighted to see so many ladies here to-night. I would have shaken my head if I had been told that so many women would be found in Ontario County at a dairy meeting. It is one of the signs of the times. It shows that women have something more in view than the one idea of marriage, as has so often been charged against them. At the Vermont Dairy Convention the ladies had an auxiliary or branch convention, and they managed it well. At the banquet there last night a lady responded to one of the toasts, and she made an excellent speech. The farmers' wives and daughters of this country are waking up to the fact that there is a great work for them to do in connection with dairying—that there is much of relief and progress for them in the new methods that are being introduced in this great business.

Last Monday morning I gave a lecture to my Dairy School class under the following heads: 1, The man; 2, the cow; 3, the food; 4, the manufacture. I asked the class which of these four walls they considered to be most important in the dairy building. Some of them said, "The front wall." But I asked them what would happen if they built a good front wall and paid little or no attention to the others. You will readily see that if no proper care was given to the whole plan, and only to one wall, the building would fall to pieces in a short time. We should build the trench before erecting the building, and the trench of the dairy business is preparation. No one should expect to succeed in this business without preparing and fitting for it, and if we are going to build a good, strong wall we should have not only well selected stone but also good mortar. I asked my class "What is mortar made of?" They told me it was composed of lime, sand and water. I then said that the mortar needed for the dairy wall was honesty (lime), grit and determination (sand), and good nature (water). The man who is sullen and sour in his temper will never make a success of dairying. With this mortar of honesty, grit and good nature then, let us lay the foundation of the dairy business.

We should give more attention to the dairy man than we have done in the past. He should have knowledge, for knowledge is power in the dairy business as well as in everything else. He must also have kindness and cleanliness. The men who are preparing themselves for rearing this dairy structure in Canada must possess these qualities without fail. It has been said that any fool can farm. That is not true. It takes more brains, skill and application to-day to make a successful farmer than it ever did, and more than it does to make a success of any other calling in life. Edison says that genius has one per cent. of inspiration and ninety-nine per cent. perspiration, and that is about the ratio for success in agriculture. Too many of the young people of this country are afraid to work and get their hands dirty. Booker Washington says that one of the greatest difficulties he finds in connection with negro education at Tuskegee is that the pupils there—some of them children of slaves—consider it a disgrace to do manual work.

It has been said that we are altogether too backward in speaking of the work done at the Ontario Agricultural College My firm conviction is that there is nothing in Canada to-day that has moulded the agricultural thought and practice of the country to the same extent as that institution has done. And the farmers are coming to the conclusion that the College is a benefit to them as well as to the individual students. The farmers of Ontario can get the benefits of its laboratories and all its experimental work, and they can have it so strengthened and developed that it will be a veritable agricultural university. We are going to have it, too. Last year the Massey estate donated $40,000 towards building a hall and library for the Agricultural College, and now Sir William McDonald has given $125,000 to erect two buildings, one for the training of teachers who will go out and teach boys and girls how to do work, and the other for the benefit of women. Any system of education that overlooks the

teaching and training of women of the farm is deficient, no matter what other features it may have. Any man who would succeed in agriculture to-day must have a scientific training. I am glad to hear that in the Maritime Provinces they are talking of building an Agricultural College.

We are giving attention not only to the dairy man but also to the dairy cow, and also to the dairy feed. Other speakers are dealing more fully with these points. One of the things that struck me in connection with my visit to the Vermont Dairy Convention was to find that they are going largely into private dairying. Old dairymen are putting in separators, and are making butter at home for the sake of keeping the skimmilk for the calves and other stock.

Dr. Fletcher, of the Experimental Farm, Ottawa, gave an interesting address on "Flowers," in which he offered some valuable hints regarding the potting and care of window plants, and the selection and treatment of bedding out plants.

Mr. G. C. Creelman, Superintendent of Farmers' Institutes, also delivered a short address, in the course of which he said : In our institute work we are trying to get close to the man who is breeding and feeding the dairy cow, and I hope all concerned will get still closer together. There should be more intercourse and more confidence between makers, patrons, owners, and buyers. Makers in cheese and butter factories should take more pains to instruct patrons regarding what seems to them to be the very intricate work of dairying. Of course, that would take up some time, but it will pay. The farmer has to do most of his learning through his eye. A professional man, a lawyer, for instance, will get most of his information out of books, he will read up precedents and all that; but the farmer gets his knowledge largely by what he sees. To him the cheesemaker is a man who is conducting a very intricate process, and he wonders, "How can that man make the best of my milk ?" If the maker is a graduate of one of our dairy schools the farmer need have little fear on that score. The maker should help the farmer to understand things. He should take him into the factory, and explain the Babcock test to him. The average farmer thinks that the Babcock test is an invention of a Yankee doctor, Dan Derbyshire, and the devil. (Laughter.) He does not believe in the test, and is afraid that he is being cheated, and it is pretty hard to convince him to the contrary. But just show him all about it. The school teachers who are making the most success in their calling to-day are those who are introducing what is known as Nature Study "on the side." They occasionally show the things that are around and about them to their pupils, and explain all about them. And so let makers of butter and cheese take their patrons into the factories and explain the processes and the machinery, and in that way they will get closer to each other, and finally solve the problem of making uniform butter and cheese.

ELECTION OF OFFICERS.

The report of the Committee on Nominations was read by Mr. Dargavel, and upon his motion, seconded by Mr. Whitton, was unanimously adopted. The list of officers will be found on page 4.

Mr. Derbyshire returned thanks to the members of the Association for re-electing him to the position of President. He was of opinion that the honor ought to go around, but he was pleased at this renewed expression of confidence. If he was wanted in any part of Eastern Ontario to give counsel or assistance he would be pleased to respond as far as was in his power. He paid a high tribute to the helpfulness of the directors and officers of the Association. He trusted that the coming year would be the most successful in the history of the organization.

REPORT OF INSTRUCTOR ZUFELT.

Last year saw the beginning of a new era in our work of instruction. This beginning, though, perhaps, imperfect in itself, nevertheless has proved to be a start in the right direction. In the turmoil and excitement of testing milk and prosecuting dishonest patrons, which formed the major portion of our work in previous years, we overlooked, or at least lost sight of, the evils which were slowly creeping in, threatening in time to seriously affect our reputation. But now that our system of giving instruction is being somewhat improved, we have had more time to investigate these evils and find out why it is we have not made the improvement we should.

Owing to a delay in making the final arrangements for instruction, it was well on towards the latter part of May before much actual work was done. From that on to the end of the season I was kept busy visiting the different factories in my district, giving instruction to the makers and addressing meetings of patrons where requested.

I visited in all 90 factories. Of this number 50 were visited regularly every three or four weeks, or as often as I could get around. The mere fact that the makers expected me to call on them at intervals acted as a stimulus to make them do their very best to have their cheese up to the mark, consequently it was not necessary for me to spend a full day with each, as the passing calls were quite sufficient to keep them on the right track; except in extreme cases where the maker was unable to cope with the difficulty. In such cases I took charge of the factory and made the cheese until the cause of the trouble was discovered. In one instance I had to spend a whole week at one factory before the source of trouble was finally located, but generally one or two days were sufficient.

Improvements in method of manufacture. Cheesemaking is becoming more and more an exact science and the elements of doubt are being gradually removed. The light of science is clearing up many a dark mystery and making possible that which previously appeared insurmountable.

Among some of the principal aids to cheesemaking lately inaugurated are the use of pure cultures, the fermentation test and the acidimeter. By the use of the pure culture we can to a large extent control the flavor of the cheese. The fermentation test is valuable inasmuch as it enables the makers to develop the predominating flavor of the different lots of milk, and if he is receiving any bad-flavored milk he need never be in doubt as to which particular patron is supplying it. By the use of the acidimeter we can with a greater degree of certainty keep a close watch on the development of the lactic acid from the time the milk is received until the curd is ready for the press. Every cheesemaker should see that his factory is equipped with an acidimeter and fermentation test and be supplied with a pure culture to be used as occasion demands.

The aim of this Association is, I believe, the elevation of the standard of quality of our dairy products. In order to do this more efficiently, all the factories should be brought under its supervision. In fact, there is a strong feeling in the country to-day that something of this nature be undertaken, and I believe the people will give their support to any scheme which has this in view. I would strongly urge upon our Government the necessity of making it possible for this Association to take up this work in a more thorough manner and to devote all their energies towards the improvement of our factories, the weeding out of incompetent makers, and the education of our farmers to produce better milk. Science has done all it can in pointing out our defects, and how to overcome them. It then rests with the people whether they will profit by this information; for unless we have better equipped factories, more skilled makers and a better milk supply, we need never expect to make any further improvement in the quality of our dairy products.

L. A. ZUFELT.

Mr. Gallagher: Will Mr. Zufelt please explain about it taking a whole week to set a maker right?

Mr. Zufelt: The trouble was finally located to be due to the milk. It was a rather peculiar section of country. It was rocky, and the rocks dipped into the soil. The season had been wet, and had turned dry quickly. The rain had collected in these little hollows between the rocks and soured and decomposed on the land. The cows got these germs in their bodies, and they got into the milk. I never saw milk sour like that in the fermentation test. It took a pretty strong stomach to stand the stench we developed in that test. It took me a week, for the simple reason that I wanted to get the sample examined by the bacteriologist. I spent two days getting the sample for the examiner, and then I had to go back for a few days to verify matters. I put a sample of that milk in the factory over night, and also placed a sample in a farmer's house, and it was clearly shown that the fault was not in the factory. I traced it to the peculiar weather of the year that made these conditions prevail. The water, as I have said, became decomposed, and the cows travelling about got the germs on their bodies, and in the process of milking it was brushed into the milk. I believe that most of the defects that the cheesemaker has to contend with can be traced directly to the filthy manner in which the milk is treated while in the hands of the farmer.

Mr. Gallagher: I had considerable trouble with butter becoming mouldy. What caused that, and what will prevent it?

Dr. Connell: I had not an opportunity of examining Mr. Gallagher's creamery, although I did see the butter. It was the worst moulded butter I ever saw. It must have been either in the salt or from the creamery itself, or from some of the milk that had been brought in.

Mr. Zufelt: There is no necessity of making poor cheese. Educate the farmer to produce good milk, have the proper sort of factory for making it, and we will furnish you with a skilled maker. We have been trying to begin at the wrong end. If you wish to build a house you should start at the foundation. If you want to make first-class cheese you must begin with the patron, the man who produces the milk; then with the maker and his buildings and appliances, and finally with the curing and selling part of the business. The work of the Association should be along these lines. The work of our instructors should not be to educate the cheesemakers. We have Dairy Schools for that very purpose. You cannot train a cheesemaker in two or three days. The inspector's work should be a sort of guarantee to the patrons that they are being served by the best kind of men. If the maker is not a fit man the inspector should report him to the patrons, and urge them to replace him with a more competent man. The farmers are the ones who are the losers by bad management of a factory, and they should be given counsel. The buyers will always look out for themselves. The farmers have their money invested in this business, and it is to their interest to see that the work is properly done, on the farm and also in the factory. I repeat that we must pay more attention to the first stages of the production—to the care of the milk, the construction of factories and the weeding out of inferior makers.

REPORT OF INSTRUCTOR PUBLOW.

I have the honor of submitting my fourteenth annual report as instructor for the Eastern Dairymen's Association.

Owing to the progressive change inaugurated this year in the system of giving instruction I was enabled to do more and I trust better work towards the improvement of the quality of the cheese in my district. In previous years my time was too much occupied in testing milk for me to devote as much attention as I would have liked to work of this kind. This year, however, I was enabled to visit regularly all the factories operated by members of this Association, and in making cheese and addressing patrons on the care of milk when requested.

I succeeded in visiting 150 factories, giving them 231 calls. Of this number 70 applied for instruction. 50 of these received one full day, and 20 two days each, with a talk to the patrons on the care of milk the evening of the second day.

The quality of the cheese turned out during the months of May and June was, if anything, superior to that of previous years, but for the months of July and August there were a lot of inferior quality, the defects being bad flavor, weak body, open texture and acid cut.

Condition of Factories. Of the 150 that I visited 25 had provided means for controlling the temperature of the curing-rooms during the hot weather. The means used in two of these was sub-earth air ducts and in 23 by means of ice on racks. I might say that I invariably found the cheese in these factories to be of good flavor and texture. The general condition of the factories might be classed as follows: 50 first class, 50 second class, 40 third class, and 10 utterly unfit to be considered as factories at all. The principal defects found in the factories were poorly-constructed buildings, bad floors, leaking vats, poor presses, filthy underground whey tanks, bad water, bad drainage and filthy surroundings. In seven of these that were having bad-flavored cheese I traced the cause directly to the filthy condition of the factory and surroundings, and as soon as these were remedied the trouble ceased.

In summing up the sources of defects found in the cheese I find that they are about equally divided among poorly-constructed and equipped factories, incompetent makers and bad milk. Any work then which we do in the future should be towards the improvement of these conditions. In my opinion the most efficient way in which to accomplish this would be to organize the factories into combinations, with competent instructors in charge, whose duty would be the instructing of patrons in the best methods of producing, caring for and delivery of milk, and the necessity for having the factory which they patronize properly constructed and equipped, with a competent maker in charge; also to visit the factories regularly every two or three weeks to see that the makers were doing their duty. This would tend to the production of a more uniform quality of cheese, and make it possible for each combination to make a reputation for itself, which would aid very materially in enhancing the value of the product.

G. G. Publow.

The President: It is no light matter that ten cheese factories in one district are unsuitable for receiving milk. It is a lasting disgrace to Eastern Ontario. The visits and advice of our instructors are calculated to improve these matters. The makers deserve to be blamed for much of this state of affairs. If they are true to themselves they can easily force action by refusing to make in such unsuitable factories.

Mr. Echlin: I would like to know what sort of cheese were made in these fifty first-class factories? Is a factory first-class without some special arrangement for curing cheese?

Mr. Publow: About twenty-five had ice, sub-earth ducts, or some such means of controlling temperature. The other twenty-five had good buildings and clean surroundings, with good drainage, and nothing at all disagreeable about the factory. The utensils in all of these fifty were clean, and this, I consider, goes largely to make a first-class factory. You seldom find clean utensils in a poorly-built factory. We do not get bad-flavored cheese from factories where things are kept clean. This vile cheese comes from factories that it is a shame to continue in existence. They allowed the whey to fester on the floors. Cheese of that character at first looked well. They bore well and had a good body, but they soon got stinking. Any floor that is not kept clean, dry and sweet is unfit for a cheese factory. The cement floor is all right. I am willing to work even on a wooden floor. One of the factories I visited was in such a dirty condition I called a bee of the patrons and we all set to work and cleaned the place up. The drainage was improved. fresh earth was shovelled up around the building, and everything put in first-class shape. No milk was taken at the factory until after the place had been thoroughly cleaned.

The President: Cement floor is the best where you can get a man who will make it well. It is easier to keep clean than a wooden floor.

Mr. Echlin: What did the people of these ten bad factories say when you visited them?

Mr. Publow: In every instance I called the managers together and pointed out the defects, and I may say that in no instance did they hold the maker responsible. They were ashamed of themselves, and agreed not to dock the maker.

Mr. Forster: What proportion of cement floors are now being used? Could we make it compulsory for cement floors to be put in co-operative factories?

Mr. Publow: That is a big question, and I shall have to leave the answer of it to some other person. We took samples of milk in every case where bad flavors were suspected, and we went to the persons concerned and explained matters. In one instance I found the manure piled up back of the wall of the cow stable. In another case I found sawdust, and the cows stamping around it. The rest of them were milking in yards where they have done their milking for years, and the cans stood there over night. I found that the farmers were surprised when I told them that the injury came from the yard. They thought that the gas came from the milk. They were thunderstruck when I told them that the gas came from outside influences. Start at the very foundation—with the producer of the milk.

The President: The average factory to-day will ask for tenders for the making of cheese and butter at the lowest price. They seldom seem to consider the ability of the applicant. They seem willing to squeeze the blood out of the very body and soul if they can only get the big end of the bargain. (Applause.) But if they will get men who have had a dairy education such as that now furnished by our Dairy Schools, and will pay them well, it will help to build up the industry in that locality, and such makers also will help to educate the community.

Mr. Gould: I have the floors of my stables made of cement. I have them cleaned every day, and all the cow manure taken to the fields daily. You cannot find a pound of manure or straw in the barnyard. Everything goes to the field daily. Do makers in cheese and butter factories go around among their patrons to see if they are getting the best out of their cows, and if the stable and other premises are in the right condition to give the best quality of milk for manufacturing into dairy products? How in the world makers can make good butter or cheese from milk of cows in the condition I have seen them is a mystery to me. I have travelled for Farmers' Institutes three years. I went home once with a man who is an officer in an institute. He would not let me go to his stables until after supper. When I got there I soon knew why he didn't want me to go. (Laughter.)

The President: It is a fine sight to see those pretty girls milking in nice, clean stables or yards.

Mr. Forster: In our district you would have to go to the house to see the girls, for we men do all the milking. (Laughter and applause.)

REPORT OF INSPECTOR BENSLEY.

I have the pleasure of handing you my ninth annual report as instructor for this Association. The district allotted me was the same as in former years, the counties of Lennox, Addington and Frontenac. I visited 80 factories during the season, commencing work the 6th of May, and finishing the 28th of October, working in all 152 days. Of this time 130 days were spent giving instruction and testing milk; balance of time was spent in travelling, attending cheese boards, attending court and settling milk cases.

I am pleased to say the number of offenders as regards tampering with milk has decreased very materially in my section, there being only eleven samples found wrong out of 5,000 samples tested. After interviewing the parties to whom the milk be-

longed settlements were made with nine, two standing out, which made it necessary for me to prosecute, winning both cases. The amount received from factory men for my services was $400, fines $150, half of which comes to the Association, making a total of $475.

I found the makers, with few exceptions, doing very good work; some of them have great difficulties to contend with, such as dirty, bad-flavored milk; others, who have good milk and nicely-made cheese, have not a fit place to keep them in after they are made; no control of the temperature whatever, curing-room no better than a barn. It is useless for me to say what the results are where such conditions exist. Another difficulty they have to contend with is the shipping of the cheese too green. There were two instances in particular where the cheese was made on Saturday and shipped on the following Monday. I have warned salesmen repeatedly of the wrong they were doing, but nothing seems to be a warning to them. It is very much with the salesman selling cheese as it is with the patron sending milk—all we care about is to get it off our hands.

Now, in my opinion there is not a patron sending milk to a cheese factory today but knows perfectly well how to properly care for milk, but the great trouble is to get them to do it.

This report I have confined to the work actually done, but shall be pleased to give any further information.

G. H. Bensley.

REPORT OF INSTRUCTOR LOWERY.

I have the honor of presenting my fifth annual report as instructor for this Association. The district assigned me was Campbellford, Madoc, Stirling, and Lindsay sections. My work for the past year, as in previous years, was chiefly testing milk and instructing cheesemakers. I commenced work on May 1st and finished on November 11th, working in all 167 days for the Association. I visited officially 80 factories, nearly all receiving two visits and some three.

Out of these factories I found twenty-five samples of deteriorated milk. After investigation fourteen of these parties were fined, ranging from $10 to $50, the total of which amounted to $280. Six of them were settled by the managers of the factories and the other five gave satisfactory evidence to clear themselves. I am glad to state that the number of cases of deteriorated milk sent to factories is decreasing rapidly in the section I have covered for the last five years. This goes to show that in a few years we will have no trouble along this line, which is so unpleasant. The fewer the cases the more time we will have for instructing the cheesemaker and also the farmer who produces the raw material, for on more than one occasion this season I have returned the milk on account of the cans being actually filthy. It is impossible for the most skilful cheesemaker to make fine-flavored cheese from such milk.

The amount of money contributed by factory men for my services was $475, which, with the half of the above fines, makes a total to the Association of $615.

As my territory was changed this year I had the opportunity of inspecting the factories in Lindsay section, in Victoria county, and, although younger in the business, I find that a number of them have good buildings, well equipped for making cheese. Yet I am sorry to say that, as other sections, there is room for a vast improvement in a lot of them, especially their curing-rooms, but I find a gradual advancement in the improvement of factories throughout the whole territory. I was very much surprised when working in Lindsay section at the late arrival of milk at the factory, especially in the warm weather. I visited factories which had 75 patrons, where the first can of milk did not arrive until 8 o'clock. This gives the cheesemaker a very poor chance, for milk, with ordinary care, cannot possibly be in good condition coming in at such a late hour.

After all that has been said about cleanliness and the importance of it in manufacturing cheese or butter, I still find a few who do not take the advantage of it and go right on in that careless, indifferent way. These are the factories where we find the poorest quality of cheese.

It has been stated by good authority that we are losing ground in the English market in regard to the quality of our cheese. There have been several reasons given for this depreciation, but I think one good reason has been overlooked. As for who is to blame I canot say, whether it is the farmer or cheesemaker, but in this section I find that the cheesemakers are the most to blame for cutting prices so low that some of our best cheesemakers were forced to leave the business and seek other employment.

J. B. LOWERY.

REPORT OF INSTRUCTOR HOWEY.

The district assigned to me was, as in former years, Prince Edward, part of East and West Hasting and part of Addington counties. I commenced work the 8th of May and finished November the 9th, working in all 152 days. Of this time 132 days were spent in visiting factories, giving instructions and testing milk. The balance of the time was spent in travelling, attending cheese boards, attending court and settling milk cases.

The number of factories visited was fifty-seven. Of these I found twenty-two patrons sending deteriorated milk: seventeen paid fines to the amount of $374.50; the remainder were settled by the officers of factories. The amount contributed by factory men was $331, which, with the amount of fines due the Association, makes a total of $518.25.

I might say in conclusion that only about one-third of the factories that I visited were suitable buildings for the manufacture of first-class cheese, and you are all aware the past season has been a grand one to locate these old structures, and many a poor cheesemaker has had to cough up with a heavy reclaimage. Why is it? Because they sign contracts to manufacture first-class cheese in these old structures. There are a lot of young cheesemakers who have not the ability or knowledge to manufacture first-class cheese in an up-to-date factory, let alone these old structures. . But why do they get these contracts? Because they are the cheaper men. I am sure if this evil is not remedied it will be the ruination of our cheese industry.

HUGH HOWEY.

REPORT OF INSTRUCTOR PURVIS.

I herewith submit this, the ninth annual report of my work as instructor. Though my work was the same as in former years I devoted more attention to the instruction of the makers than usual, and though I tested milk in nearly all the factories I visited I also assisted the makers all I could.

I commenced work on the 4th day of May and quit on the 5th of November, during which time I worked 149 days, as follows: 136 in factories testing milk and instructing makers; I visited 83 different factories from one to four times; eight days were spent in travelling, and five I was detained on account of rain. I found less tampering with milk than ever before, only eight cases of fraud, which were all settled by me, showing that the dishonest patrons are developing a wholesome fear of the consequences. The amount of money contributed by the patrons and factory men in the form of fees for my services was $507; collected from patrons accused of tam-

pering with their milk, in settlement therefor, was $146, half of which went to the Association, making a total for the Association of $580. The season started out nicely, but there was considerable fault found with the quality of the summer cheese on account of the cheese having been made to cure too rapidly, and then shipping them out too soon after making, it being a common practice in some sections in my district to ship the cheese made on Wednesday on the following Monday. Indeed, they in the Alfred section beat that, as eleven (11) factories there ship every other Monday, and take the cheese made on Saturday out of the hoops and send them off, cleaning the shelves completely. Competition to see who can get the best average, resulting in leaving too much moisture in the cheese, is another cause of complaint, as it results in the cheese going off flavor if not cured at a very low temperature, conditions that do not obtain at the average factory. I find that where sufficient time is given to thoroughly cook the curd before the whey has to be removed the cheese are generally all right.

I visited 83 different factories, spending 136 days in them.

A. P. Purvis.

REPORT OF INSTRUCTOR WARD.

I have the honor of now presenting to you my fourth annual report as instructor and inspector for this Association for season 1901.

I commenced work on May 13th and finished on November 1st, spending in the employ of the Association 149 days, as follows : 143 days spent making cheese, testing milk and instructing ; 4 days attending cheese boards ; and 2 days detained on account of rain. During this time I also made 97 call visits. The number of factories visited was 77. Of this number 59 were under my charge, and of these 59 factories, 20 pay by the per cent. of butter fat. In the factories in which I tested, 4,992 samples of milk passed through my hands, of which number 12 were found to be deteriorated ; a large decrease from last year. I settled 4 of these cases, and the balance were dealt with by factory management.

The amount of money collected is as follows : From boards, $250; one-half of fines ($60), $30 ; total, $280.

In the section I have travelled over for three years I find a steady and decided improvement in the quality of milk delivered and cheese made. There are a few things besides the instructing and inspecting that have to do with this steady improvement in this section, and I think it will be well to bring them out here. They practically make no May or November cheese, return no whey in milk cans, sell their cheese every two weeks, and, last but not least, give their makers better pay than some sections.

There are a great many things which I might touch on in this report, but no doubt they will all be brought out in the discussion. But one thing I cannot let pass, for I know it is doing untold injury to the fine and good keeping qualities of our cheese ; that is, over-ripening milk, using too much starter, and an improper starter. For an improvement in the quality of our cheese I do not think I can better end this report than by repeating the three statements which were made by Professor H. H. Dean at the western convention last year, if that gentleman will allow me to do so : 1st. The patron should supply the cheese factory with clean, cool milk. 2nd. The cheese factory shall be clean, with no rotten wooden floors, or wooden gutters. 3rd. The cheesemaker should understand how to use and prepare cultures and starters, and use them with judgment.

R. W. Ward.

REPORT OF INSTRUCTOR RABB.

I have the pleasure of presenting to you my second annual report as instructor and inspector of creameries for this Association. My work this year was the same as last, differing only in the amount done. I visited the creameries and gave instructions in the details of manufacturing. I am pleased to be able to say to you that I found the general condition of the factories, and the quality of the butter made, somewhat improved, but there is one feature of the business that is not altogether satisfactory. To make a number one article of butter we should have a better quality of milk. There is great need of improvement here, but it seems to be difficult to get the producers to put into practice what they have in theory.

It is a satisfaction to me to report that a large number of our winter creameries have again opened up, while a number of new ones have been started. Further than this, I believe the general sentiment of the patrons is gradually turning to the idea of a shorter cheesemaking term each year.

During the season I have tested about two thousand samples of milk, out of which I found seventeen had been tampered with. Upon these guilty ones I had the unpleasant task of imposing fines, ranging from $10.00 up to $50.00, which amount went to the general factory fund, of which they were patrons.

A. B. Rabb.

Mr. Woodward: Did the inspectors find many culls in the factories, and, if so, were these culls marked as a special brand before shipping?

Mr. Publow: We did find some culls. What was done with them would depend upon the honesty of the maker. Where the maker was honest and wise he would brand these culled cheese; but sometimes they slipped through. It is not because makers do not know enough to be honest and brand cheese; but a few fellows will try and sneak culls through, although they could not make a greater mistake. Every maker should be honest enough and wise enough to brand cheese, for the sake of his own reputation.

Mr. Whitton: Mr. Purvis ought to explain about those quick shipments of cheese. If they were made on Saturday and sent off on Monday they must have been cured on Sunday only. (Laughter.)

Mr. Purvis: In the section of country I cover they have no large factories. One of them may make six a day. In one case the teamsters went there and took the cheese out of the hoops in my presence. I made a kick about it, and they told me to see the salesman. These cheese were brought out for shipping, and were left on the platform for hours until the train came along. The salesman told me that after the cheese left they were put into cold storage at Montreal. He said that the Montreal men would see to that, and that they made allowance for shrinking in the weight.

The President: Then a patron who milks on Friday can have his money for the cheese on Monday? (Laughter.) But, speaking seriously, you have no idea of the number of people who are of the same mind as that salesman. If they can only dump their cheese on the platform, and get the receipt, they do not care what becomes of the consignment. If we will have a good reputation in our own neighborhood, and in the old country, we must do the decent thing all through this dairy business. The cheese must go in the best possible way, so that the man who buys them will have a good opinion of their quality. We have men in England who have been getting cheese from our firm for years, and they never think of asking about quality. They take that for granted, because we would never think of sending them bad cheese. It does not pay to handle poor goods. I do know that in one case we culled fifteen cheese, but we found that in the fall they had slipped in again. They had actually been sent to the old country, and had escaped the inspector at Montreal. That shows that even where closely guarded against some culls may be sneaked through. But that sort of thing never pays anybody concerned. In this particular transaction I had the facts and figures to prove the fraud. I

had a bill of $100 sent to that factory for the fifteen culls they had palmed off on us. I told them that if the affair was not settled on that basis I would put it in my solicitor's hands, and the money came. (Applause.) The man in the old country is likely to get it into his head that you do this thing knowingly, and you cannot afford to deceive them. If you think that it is possible to slide culls through and maintain the reputation of our cheese at the same time, you are badly mistaken. You must have better factory buildings. You must hire honest and skilful makers, who will be educators to their respective neighborhoods. Only the best article made will enable us to retain our British trade. We must have a pride in our business if we are to succeed. I am glad to be able to say that we have hundreds of factories that never made finer cheese than they did in 1901. They had no short weights, no poor broken boxes, and have given no trouble to the buyers on either side of the water. The trouble is with the fellows who try to run things on the cheap—cheap buildings, cheap boxes, cheap makers, cheap reputation. The man who does not want to go into the dairy business on a proper scale of efficiency in the size and style of the factory and the skill of the maker, should get out of it and keep out—as the saying is, "Go 'way back and sit down."

Mr. James : How will you prevent the shipping of this cheese ?

The President : If you ship to me I can stop it in the third week. Make it so that he will handle his product right. Pay him a lower price than he would otherwise get. Make it uncomfortable for him to do wrong.

Mr. James : Will he not then sell it to someone else ?

The President : That other man will soon get on to the fellow, and so his head is finally chopped off. I believe that we are going to remedy this thing. If any fellow tries to palm off any of this poor stuff on me, then the Lord have mercy on his soul ! (Laughter and applause.)

Mr. Purvis : That business of early shipping seems to be growing. A few years ago the cheese was sent at a week. They put in the Monday cheese and got an increase of weight. Now a good many are shipping cheese made on Wednesday as early as the following Monday.

Mr. Dargavel : Is it not possible for instructors to lay this matter before the patrons ? If the patrons really understood the iniquity of the business—the losses they were sustaining individually, and the losses to the country, through making this poor cheese and shipping it so early—would there not be an awakening right there ? Let our instructors call the patrons together and tell them in such cases that the maker is trying to do impossible things in endeavoring to make first-class cheese in a factory that is unfit for the work. Let the matter be brought right home to the patrons. Also show the patrons that in many cases they are producing milk that is unfit for making good cheese. There are many troubles about this cheese business. In the first place, the cheesemaker is running in hot opposition to the neighboring factory, and on that account is taking milk of which fifty per cent. is unfit for cheesemaking. The manufacturers are afraid to say a word against their patrons for fear they will trot off to the next factory, where the maker will be only too glad to take the milk from his competitor. The patrons little think of the injury that they are doing to the trade in taking such poor care of their milk. They do not think that while they are getting rid of their inferior milk they are paying the penalty of getting a reduced price for the reduced quality of the cheese made from it. Let them be shown this as plainly as it can be told them. I would suggest that if the inspector visits any factory that, in his opinion, is not in a condition to make good cheese, he will at once call a meeting of the patrons, and make the facts clear to them. What is the use of us sending our inspectors, and paying them from year to year to instruct cheesemakers who have not the building or the appliances with which to make the best article ? Tell the facts straight to the patrons. Encourage the erection of larger factories, and see that the patrons are taught their part in this great work.

Mr. Whitton : I am surprised to hear what Mr. Purvis has stated about those new cheese being shipped. They must have some strange buyers in the far eastern part of the Association limits. (Laughter.) When we buy our cheese in the Belleville region no

one thinks of slipping in any of these green cheese. We never think of shipping cheese under ten days old. In Peterborough they sell their cheese only once a fortnight, and it is sold on the board. They never sell any cheese less than ten, twelve, or fifteen days old. I call Peterborough the banner district. (Applause.)

The President : Do you pay the same price in the factory that you do on the Board ?

Mr. Whitton : Yes ; for No. 1 cheese. There is nothing more damaging than to have cheese sent out as green as that described by Mr. Purvis. Cheesemakers are also using too much starter, and inferior starter, causing the cheese to ripen too fast and go off flavor. We are not getting the proper cooking of our curd, but are making a mushy cheese—one that is too soft.

Mr. Free : I have a great deal of respect for some of the inspectors, especially for Mr. Zufelt and Mr. Publow. I believe that careful scrutiny as to fitness should be made before inspectors are sent out. Of course a man cannot make good cheese in every place. I would like to know what kind of brand is placed on this culled cheese. We make none in our section, around Cobourg and Brighton. I always tell the supply men to send me the best boxes they can furnish. I do find, however, that some of the boxes are too large. One cannot have cheese boxes too close fitting ; keep them snug and tight. I think that too much stress has been laid upon the work of the cheesemaker. The average cheesemaker does try to improve things. I have given instruction to my patrons. Some of the milk a maker has to handle is unfit for cheesemaking. One year I got stuff that nearly killed me and my men, but we finally got things improved. The buyers should be fairer to the good makers, and not make them suffer on account of the doings of those other miserable fellows. I am a believer in the Babcock test if handled properly, but with a man who cannot handle it right it is an injury to the business. An oily-tongued cheesemaker can slick it over. I have a Babcock test, but I have never paid by it, because I see the unfairness of the principle. The prices that are now paid for the making of cheese in some places are such that a man cannot live by it, nor can such an underpaid man be expected to do proper work.

Mr. Publow : Regarding the cause of soft cheese, of which there has been so much complaint, I may say that it is largely traceable to the use of too much starter. Too much starter causes fast ripening ; the cheese will be weak in texture, and be inclined to be better. Stop using so much starter. In fact I would advise you not to use any starter at all if you can get good results without it. A starter will be beneficial if the milk lacks acid for bringing about fermentation in the proper time, but not otherwise. Cheese cannot be made in such manner that they will be meaty and mellow in one week. You cannot ship green cheese and expect the best results. It is true that a softer cheese has been asked for—one that will break down more quickly. This cheese made with a hot of starter can be cooked quickly, and can be placed in the hands of the buyer early, and he may like the appearance of them at first, but they will not stand the test of time. I saw some of the cheese referred to to-day as having been shipped green. It was then six weeks old, and the holder of that cheese was disgusted with it, although it had been held in cold storage in Montreal. It was then a soft, pasty, bitter cheese. The cheese we want for consumption must be soft and mellow, and have a nutty flavor. Have them made firm before there is too much acid developed. Set the milk sweeter than you have been doing. Take more time in cooking, and expel the moisture sufficiently. Get proper body and texture. Use no starter if you can get good results without it. If you have tainted milk it is a benefit, but do not abuse its use. I would urge every maker to take a course at the Dairy Schools at Guelph, Strathroy or Kingston. Meetings such as this should not have the time taken up with instruction in making cheese and butter. Go to the Dairy Schools and be thoroughly fitted for your work. There should be an inspector and instructor for every combination of factories, so that he could inspect them every two or three weeks, and thus keep them in uniform condition. We have men in the Belleville and Brockville sections who are stamping their cheese, but I have never come across any branded as No. 2. I have often found second and third class cheese branded as first-class, however. Let the inspectors brand the cheese according to their real

class. We want to educate our patrons and makers so that our cheese will be such that the consumer will pay the best price for it.

Mr. Echlin : In speaking of never having seen a second-class brand put on, does Mr. Publow refer to the cheese or to the boxes ?

Mr. Publow : I mean on the cheese.

Mr. Echlin : How does the maker know in the early stage of the work whether he should brand that cheese as first-class or not ?

Mr. Publow : He can largely tell. The character of the curd is generally the character of the cheese.

Mr. Echlin : Stay right with it, and put a big brand on if you have to do it by lamp-light.

SILOS AND SILAGE.

At the request of several dairymen present Prof. Dean gave a five-minute address on growing corn and building silos. A dairyman, he stated, could grow more feed on an acre of land devoted to corn than he could by growing any other crop. From three to four times more digestible food can be produced with a corn crop than with hay on the same area of land.

Select a variety of corn which will yield a large crop of ears, stalks and leaves, and one which will mature in the locality before frost. Sow in drills or plant in hills—the latter if the land has many weeds, as horse cultivation may take the place of hand cultivation to keep the weeds in check.

If possible plow clover sod after haying, and work well on top for the remainder of the summer. Manure in the fall or during the winter. It is a good plan to ridge the field late in the fall, where practicable. In spring level the ridges, and cultivate well in order to prepare a good seed bed. Sow or plant the corn the latter part of May. Follow with shallow cultivation, especially during the latter part of the season, in order to retain the moisture in the soil for the corn plants and not cut off the feeding roots.

Cut the crop as soon as the ears are fairly well matured, and put into an air-tight silo. There are two requisites in making good corn silage : mature corn and an air-tight silo. Tramp the corn in firmly while the silo is being filled. Do not depend upon corn silage alone for feeding cows to produce milk, but clover hay and mix with the silage. Also give mangels and about eight pounds of meal for each pound of fat produced in the milk, or for every thirty pounds (3 gallons) of milk which the cow is giving.

The speaker recommended a cement silo for those who could afford the first expense. For men of limited means and for men living on rented farms the stave silo was a cheap means of providing suitable storage for corn. A bulletin on "The Stave Silo," published by the Department of Agriculture at Ottawa, should be in the hands of every dairyman who contemplates building a stave silo. The bulletin may be got for the asking.

The cement silo is much more durable, if properly built, than any form of wooden silo, hence is to be preferred on account of its durability. The first cost which approximates two dollars per ton capacity, prohibits its adoption by many farmers, Where a farmer really desires to lessen the cost of milk production he will be certain to erect some form of silo and grow corn to fill it. A cheap, square or oblong silo may be built in one corner of a barn out of studding 3 " x 10 ", lined on the inside with one thickness of matched lumber. This form of silo will make good silage at a very low cost for the building, although it is better to have the silo separate from the barn or dairy stable, but closely connected with it.

A smaller silo filled with good corn silage for summer use is also a necessity on a dairy farm when the pasture becomes parched and animals are searching about the fields for something to eat. It does not pay to allow the cows to shrink in their milk flow early in the autumn for lack of suitable feed. About twenty pounds of corn silage daily and about four pounds of bran or chopped oats will assist very materially in keep-

ing up the milk flow at a season when milk, butter and cheese are frequently at the very best price.

Mr. Forster : In regard to the concrete silo, does the corn not dry out towards the edge ? Does it not frost in very cold weather around the edge ?

Prof. Dean : We do find at the College that there is some frosting, and that there is some spoiling around the edge ; but take it all together, it gives the best satisfaction. The concrete silo is built to endure. Some silos have been built of stone, but I think cement makes the best silo ; certainly it is better than stone.

A Member : Do you shred the corn ?

Prof. Dean : No ; we do not shred, although I think that is a good plan.

A Member : What about clover silage ?

Prof. Dean : You do not get half as much out of clover as you will out of corn, if both are placed in the silo. Corn silage is the best for giving returns, acre for acre.

Mr. Gould : When I built my silo I had not the means of building a cement one, so I had to devise something cheaper. I conceived the idea that a tub of any kind, if hooped tight, would be successful. So I put the idea into practice, and built the first round silo in Canada. I find that you do not need to go to the trouble of bevelling the edges. Just get ordinary planks, fit them carefully, and you will be able to have a silo at a very low cost. I can build a wooden silo for the interest for ten years of the money it would take to build a cement one. There are twenty-two silos in sight of my farm. You can make just as good ensilage in a wooden silo as you can in a cement one. If a farmer is so shiftless that he cannot take a little time in the month of June or July to tighten his hoops up he is not fit to be a farmer. I have had ensilage frozen in my wooden silo. Under such circumstances I just leave it until the warm weather comes, and it is thawed down, and then give it to the cattle, and I get about as good results as I do from the unfrozen ensilage. What I am looking at is that I must make every dollar count, and if I can see that I can save a few dollars by the use of a wooden silo I am going to do so.

Mr. Sprung : We have a man in our section who feeds silage, and you can smell it off him when he sits in his pew at church on Sunday. (Laughter.)

A Member : What would you recommend for scouring in calves ?

Prof. Dean : Put a little lime water into the milk, and keep the calf away from others for a while, as sometimes scouring is contagious.

BRITISH TRADE STATISTICS.

The following resolution was moved by Mr. J. R. Dargavel, seconded by Mr. Wm. Eager, and unanimously adopted :

"Resolved, (1) That the Eastern Ontario Dairymen's Association has learned with regret that the system practised by the department of the British Government having charge of the preparation of the Imperial Government returns as to imports of agricultural products is such that agricultural products received at British ports are classified as imports from the country from which the same happen to be shipped instead of the country in which they were produced.

"(2) That in the opinion of this Association such a practice is most unjust to the agriculturists of this Dominion, as it makes the value and the amount of Canadian exports appear to be much less than they really are.

"(3) That this practice works greater injury to the dairymen of Ontario by crediting large quantities of our superior dairy products to the dairymen of the United States, and tends to lower the price of Canadian dairy products which are shipped from Canadian ports.

"(4) That the President and Secretary be instructed to prepare a memorial to the Minister of Agriculture for the Dominion requesting him to make strong representations as to the injustice resulting from this system, and to urge that the present system be so varied that the record of imports shall show in what countries the various agricultural imports were produced, instead of the countries from which they happen to be shipped."

AUDITORS' REPORT.

Statement of Receipts and Expenditures of P. R. Daly, Esq., Treasurer Dairymen's Association of Eastern Ontario, 1901 :

Receipts.

Cash on hand from last audit	$1,350.52
Membership fees	211.00
Advertisements	215.00
Legislative grant	4,000.00
Prosecutions	505.25
Fees from factorymen	2,255.00
Total	$8,536.77

Expenditures.

Reporter	$100.00
Exp. Annual Convention, 1902	613.75
Butter inspector, Mr. Rabb	250.00
Printing	148.25
Advisory Board, Kingston	230.00
Advisory Board, Toronto	285.00
Postage, telegrams and stationery	73.00
Officers' salaries	190.00
Local Committee, Belleville	109.00
Industrial Exhibition	50.00
Typewriter for Secretary	125.00
Discount on cheques	2.75
Law fees	17.00
Acid for inspectors	20.00
Com. arranging for Convention	40.00
Hugh Howey, salary and exp'n's	760.00
R. W. Ward, " " "	775.00
J. B. Lowery, " " "	835.00
G. H. Bensley, " " "	760.00
G. G. Publow, " " "	1,000.00
L. A. Zufelt, " " "	1,000.00
A. P. Purvis, " " "	924.85
Balance on hand	228.17
Total	$8,536.77

We, the undersigned, hereby certify that we have examined the accounts and vouchers of P. R. Daly, Esq., Treasurer Dairymen's Association of Eastern Ontario, and find them correct in accordance with above statement.

MORDEN BIRD,
F. W. BRENTON,
Auditors.

On motion of Morden Bird, seconded by F. W. Brenton, the report of the Auditors was received and adopted.

PASTEURIZING AS APPLIED TO BUTTERMAKING.

BY J. A. RUDDICK, CHIEF DAIRY DIVISION, OTTAWA.

Pasteurizing as applied to buttermaking, to use a somewhat trite expression, has long since passed the experimental stage. The laws of Denmark make the pasteurizing of all dairy products compulsory. Many of the leading creameries of Australia and New Zealand have adopted the practice. The Great Berry Central Factory of New South Wales, one of the best known creameries in the world, after a series of experiments, decided some time ago to make pasteurized butter. The New Euroa Factory in Victoria, another prominent institution, has also installed a complete plant for the same purpose. It has been proposed in both New South Wales and New Zealand to make pasteurizing compulsory, in the belief that such a course would be in the interest of the export trade in butter.

To come nearer home, we find that some of our very best and most successful creameries have adopted pasteurization with every satisfaction to themselves and to their customers. In view of these facts we can hardly afford to ignore the question, and it seems to me we should give more attention to it than we have done in the past, especially in connection with our winter buttermaking. There are, however, many who do not believe in pasteurization from the buttermaker's standpoint. Some hold that it is only a substitute for cleanliness, and that it would encourage carelessness in the

handling of milk, and thus prove a barrier to real progress in the direction of securing better milk. Others think the flavor of butter is injured by pasteurizing, claiming that the butter never has the fine, delicate aroma which unpasteurized butter may have.

As for the first contention, there is undoubtedly some truth in it, but it would be a great mistake to assume that when pasteurizing is followed the necessity for cleanliness in the handling of milk is lessened, even in the slightest degree. Moreover, as we shall see later on, pasteurization properly carried out goes a good deal further than to act merely as a corrective for the dirty or careless handling of milk. In regard to the matter of the flavor of pasteurized butter ; I think it must be admitted that when fresh made it may not have so high or so full a flavor as some butter which is non-pasteurized, but the crucial test for flavor in export butter should not be applied until the butter is two or three weeks old, because it is always that long before it reaches the consumer, or even the English market that handles it. At this stage the aroma, that fine, delicate flavor perceptible to the sense of smell, is gone from any butter, whether it is pasteurized or non-pasteurized. My experience in comparing samples of pasteurized and non-pasteurized butter, made from the same cream, is that the non-pasteurized has frequently scored the highest in flavor when fresh made, but only when the cream had been in what might be called nearly perfect condition. After keeping it a short time the relative positions have invariably changed, on account of the non-pasteurized butter deteriorating much more rapidly than the other, so that in the course of a week or so the pasteurized butter had the best flavor of the two.

The same thing may be said about washing butter, for it is a fact that butter will often have a better flavor for a day or two if it is not washed at all, and yet no one seems to argue that the washing of butter should be dispensed with, because we have learned conclusively that such treatment improves its keeping quality very much.

Saltless Butter. As there is likely to be an increased demand for saltless butter the question of pasteurization grows in importance to the buttermakers of Canada. Higher prices are being offered for this class of butter, but in order to be acceptable it must have a perfectly clean and milk flavor. A large proportion of our present output is unfit for being made up saltless on this account. The salt in butter acts as a mild preservative, and it also adds a flavor which has the effect of masking to some extent any inferior flavor which may be present.

Object of Pasteurizing. The object of pasteurizing is to restore the milk or cream to its normal condition as regards bacterial content by destroying those undesirable germs which get into it after it is drawn from the cow, and thus prepare the way for the buttermaker to control the flavor by introducing the right kind of fermentation through the medium of pure "cultures." It is true that proper precautions taken at the time of milking and in handling the milk afterwards would obviate the necessity for it to a certain extent, but in ordinary practice it is not possible to exclude from the milk all the injurious bacteria, and the argument that pasteurization is not advisable because the necessity for it may be avoided is like saying that straining the milk could be dispensed with if people would only take the necessary precautions.

Feed Flavors Eliminated. There is another and very important phase of the question which must not be overlooked, and it is the well-known fact that objectionable feed flavors are removed in part if not wholly by the process of heating, which causes them to vaporize very rapidly. I wish to qualify that statement to this extent, that I do not believe all feed flavors can be removed by pasteurizing, because otherwise it might be inferred that the persistent flavor of turnips could be got rid of in this way, which would not be correct. Finally, it must be admitted that the greater uniformity in flavor that would follow the general adoption of pasteurization would be of great value to the buttermaking industry by bettering our reputation for general excellence of product, and thus improve our position on the Old Country markets. The creamery system depends for its existence in no small measure upon this quality of uniformity, and Canadian buttermakers are somewhat handicapped in this respect owing to the comparatively small size of the creameries, so that anything which will tend to lessen this drawback should receive careful attention.

The Practical Application. Now, as regards the practical application of these principles, there is a good deal to be said. There are different ways of carrying out the work, and the choice of method will depend somewhat on circumstances, and on the particular object aimed at. When only the quality of the butter has to be considered, it is sufficient to pasteurize the cream after separation, but when it is also desired to lessen the danger of spreading disease by means of the skim milk the whole milk may be heated before separation. This plan increases the capacity of the cream separators fully one-third, as it is found that the cream separates from the milk more readily at the high temperature. An alternative plan is to separate at ordinary temperature and heat the cream and skim milk afterwards. For heating whole milk or cream a regular pasteurizing machine must be used. There are several styles now on the market, and those known as continuous pasteurizers are the best suited for the purpose. An elevating attachment is usually an advantage, and there should always be some device for regulating the inflow of milk or cream which makes it much easier to avoid variations of temperature. It is desirable that those parts of the machine coming in contact with the milk or cream should be made of tinned copper, not only for the sake of durability, but because copper conducts heat over five times as readily as steel or iron. For pasteurizing cream the temperature should be raised to 158 or 160 degrees, and as much higher as the cream will stand without taking on a permanent cooked flavor. Just what point that will be depends somewhat on the temperature of the cream as it enters the machine, and also upon the efficiency of the machine itself. I should not recommend a temperature for whole milk higher than 180 degrees F. in any case. It seems to be possible to raise the temperature of whole milk higher than cream without imparting to it any undesirable flavor, but the highest temperature recommended is 185 degrees F. This temperature, while it will not kill all the bacteria in milk, will destroy the most of the germs usually present. The disease-producing germs which are likely to be present, including the bacillus of tuberculosis, are said to be harmless after being heated to 185 degrees.

For ordinary creamery work, in warm weather, I am in favor of separating at ordinary temperatures, and pasteurizing the cream only. If the heating is done before separating, the skim milk should be cooled as well as the cream, and that is rather an expensive matter. There is no doubt that pasteurizing improves the keeping quality of skim milk, providing it is properly cooled, and if it is considered profitable to do so, there is no objection from a buttermaking standpoint. The heating should not cost much in any case, for the exhaust steam from the engine can be utilized for this purpose. In cold weather the cooling of the skim milk is a comparatively simple matter, because if it is run directly into the patrons' cans it is cooled quick enough for practical purposes. In dealing with the question of cooling, I want to emphasize the point that rapid cooling after heating is an essential part of pasteurizing cream, and it can only be effected by using a regular cream cooler. Cooling in a cream vat is altogether too slow a process. Even with the cooler, a large quantity of water or ice and water is required, the quantity, of course, depending on how low the cream is to be cooled, and the temperature of the water to be used. For the purpose of illustration, it will do to say that if cream has to be cooled from 158 to 62 degrees F. With water at 56 degrees, 5 to 6 pounds of water for every pound of cream will be required. If the water is colder of course a smaller quantity will do the same work.

If ice is available the quantity of water can be very much reduced, as one pound of ice is equivalent in cooling power to about ten pounds of water at 56 degrees for cooling cream from 158 degrees down to 62.

Cream or milk can be cooled to within about two degrees of the temperature of the water with proper appliances. After heating, the cream should be cooled quickly to a ripening temperature, and the pure culture added at once. Then when sufficient acidity has been developed, the cooling may be completed. For the first stage of cooling the cooler is indispensible, but for cooling after ripening a quantity of ice water in the space surrounding the cream vat will be sufficient, and, moreover, it is the only practicable way of doing it.

Every creamery should have a first-class cream cooler, even if pasteurization is not followed. The aeration of the cream passing aver a cooler as it comes from the separator is very beneficial to the flavor. All cream coolers should be constructed of tinned copper for the same reasons as apply to the pasteurizing machine.

Pasteurizing Ripened Cream. Cream which is only slightly sour, and has not reached the curdling stage, or that thick, syrup-like condition which all buttermakers are familiar with, cannot be successfully pasteurized. Curdling takes place under the influence of the heat, and there is an end to the pasteurizing. But when from 0.4 to 0.6 per cent. of acid is present, and the curdling stage has been passed, the cream will go through the machine and come out in a more fluid condition than when it went in. The results as far as we have gone in this work have been very satisfactory, but to give the matter a thorough test, the Department has procured several different styles pasteurizers, and a series of experiments are now being conducted at the Winter Creamery at Calgary, Alberta, the results of which will be published as soon as the information is available.

In view of the increase in the number of cream gathering creameries, this phase of pasteurizing is worthy of considerable attention.

That the adoption of the system has not always been successful goes without saying. There is too much involved to be no risk of failure. Sometimes we find those whose experience has been unsatisfactory condemning the system instead of placing the blame on the individual operators or imperfect machinery. It would be quite as reasonable to assume that creamery buttermaking is a failure because some creameries make very bad butter. The work must be carried out with intelligence, skill and good judgment if its possibilities are to be realized.

And now, in conclusion, I want to say that up to the present I have not been a very enthusiastic advocate of the general adoption of pasteurizing. I have studied the question to the best of my ability, have made some experiments, have noted the results as reported from other countries, and have had a great many opportunities of watching the effect on the product of particular creameries both in this country and in New Zealand, and the only conclusion I can arrive at is that it would be a good thing if all creameries adopted the system for export butter. I am not unmindful of the opposite views which are held by some men whose experience and position in the trade give weight of their opinions, but, looked at from all standpoints, the weight of evidence seems to be hopelessly against them.

MOISTURE AND SALT IN BUTTER.

By Prof. H. H. Dean, O.A.C., Guelph.

How much water should good butter contain ? is a question frequently asked. We quote from several authorities on this point. "Butter of the best quality, and possessing the best keeping properties, contains, as experience has shown, not less than 10 per cent. and not more than 15 per cent. of water." (Fleischman.)

"There is a general concensus of opinion among authorities that butter at the time of sale should not contain more than 16 per cent. of water. A high per cent. water does not appear to have any effect on the keeping quality of butter. Speaking broadly, butters containing 13½ per cent. water have the best flavor." (Richmond.)

Major Alvord, Chief of the Dairy Division at Washington, D.C., is quoted as saying last year at the National Buttermakers' Convention in the United States : "I should differ from my friend who just spoke in allowing 14 per cent. as the right standard. I should fix 12 per cent. as nearer right. There are some States in the Union, and some municipalities, which require 85 per cent. fat in butter. I hope there will be more."

In reply to a question regarding the amount of moisture in the butter which was shipped to England, Major Alvord said: "We have made it a rule not to send any butter abroad under the sanction of the United States Government that did not contain 85 per cent. fat, and that means 12 per cent. water or less."

Conditions Affecting Moisture in Butter.

I shall first quote from authorities, and then give the results of our own work.

"If the butter is churned at too high a temperature it will contain more water than at medium temperatures. Butter churned at very low temperatures also contains more water than at medium temperatures. Butter which is quickly churned has a tendency to contain more water than that churned slowly."

"If the temperatures for churning and working be too high a very large per cent. of water may be found."

"If after churning butter is divided into two parts, one being worked fresh and the other salted, the per cent. water is almost identical in the two samples. After standing, the salt butter will lose water, the fresh undergoes no such loss." (Richmond.)

"The way in which the washing is done, perceptibly affects the quality of the finished butter, particularly so far as regards texture and percentage of water."

"The smaller the granules of butter, and the colder the water used, the more water will remain in the butter without appearing in the form of drops." (Wing.)

"When butter from the same churning is divided and each portion is washed and worked in the same way, the salted butter holds less water than the unsalted."

In no case was there found so much water in the butter churned to small granules as that from large granules."

Large Granules.		Small Granules.	
Salt...............	2.52 per cent.	Salt..	2.69 per cent.
Water.............	13.98 per cent.	Water	12.15 per cent.

"It is to be expected that more water will be squeezed out of fine than out of coarse granular butter by a given amount of working." (Farrington.)

"The higher the temperature in churning, washing, or working, the less water in the butter. Warmer butter more easily parts with water." (Snyder.)

"Soft butter retains more water than hard butter." (Iowa Bulletin, No. 52.)

'Salted butter contained less water than the unsalted."

"The higher the salt content the less water the butter will contain." (Report Wisconsin Station.)

Prof. Farrington, of Wisconsin, reports that French butter "which appeared very dry" contained 15.1 per cent. moisture, and .4 per cent. salt. Good American butter which appeared to have much more moisture contained, on analysis, 12.4 per cent. moisture and 2.6 per cent. salt.

O. A. College Experiments.

These experiments began in 1897, when the average moisture in 48 samples made in the College Creamery was 11.034 per cent. Some samples, dried with a centrifuge that year, contained 9.4 per cent. water; while samples from the same churnings worked in the ordinary way contained an average of 10.1 per cent—nearly one per cent. more.

The moisture determinations for the years 1897, 1898, and 1900 were made in the Chemical Laboratory of the College. Samples were taken from numbered prints of butter from the different churnings. Some time usually elapsed between the churning and the sampling for moisture determinations. In 1901 the moisture and salt determination were made at the Dairy. Samples were taken immediately after the final working by cutting out a section of the butter weighing two to four ounces. This was melted slowly and thoroughly shaken. About three grams of the melted butter were placed in a shallow tin dish, about 2½ inches in diameter. The samples were dried from 8 to 10 hours, or to a constant weight, in a water oven.

The salt was determined by using a standard silver nitrate solution in which one cubic centimetre of the silver nitrate was equal to .005 grams of sodium chloride.

Butter salt contains 97 to 99 per cent. sodium chloride and one to three per cent. of impurities, hence the actual amount of salt contained in the butters would be slightly greater than the percentages given, owing to the impurities in the salt.

TABLE SHOWING RESULTS AT O. A. COLLEGE.

Year.	Kind of Butter.	Av. p.c. Moisture.	Av. p.c. Salt.
1898	......Made from pasteurized milk	12.2	2.9
	...... " " unpasteurized milk	12.6	3.2
1900	...... " " pasteurized milk	10.7	..
	...... " " unpasteurized milk	11.7	..
1901	...... " " pasteurized milk	13.2	2.8
	...... " " unpasteurized milk	13.6	2.1
1901	......Churned at 46 degrees	13.6	2.2
	......Churned at 56 degrees	13.5	2.3
1898	......Washed with water at 44 degrees	13.8	2.4
	......Washed with water at 55 degrees	13.1	3.4
1901	......Washed with cold water	13.0	..
	......Washed with warmer water	13.2	..
1898	......Small granules	12.9	2.9
	......Large granules..	12.4	3.7
1900	......Granules like clover seed	11.1	..
	......Wheat grains	11.4	..
	......Larger grains	10.8	..
	......Corn grains..	14.2	..
1901	......Granules fine	12.9	..
	......Wheat	13.2	..
	......Corn	14.2	..
	......No salt	12.3	..
1900	......Salted ½ oz. per lb. butter	10.4	..
	......Salted ¾ oz. per lb. butter	9.8	..
	......Salted 1 oz. per lb. butter	9.4	..
	......No salt	12.9	..
1901	......Salted ½ oz. per lb. butter	13.1	2.5
	......Salted ¾ oz. per lb. butter	14.0	2.6
	......Salted 1 oz. per lb. butter	13.4	3.4
1901	......Worked once	12.4	2.5
	......Worked twice	12.6	2.2
	......Worked three times	10.7	2.1

CONCLUSIONS FROM THE O. A. C. EXPERIMENTS.

1. Butter made from pasteurized milk contained from one-half to one per cent. less moisture than similar butter made from raw or unpasteurized milk.

2. A difference of ten degrees in churning temperature made practically no difference in the amount of moisture in the finished butter.

3. Butter made by washing with water at 44 degrees contained an average of .7 per cent. more moisture than similar butters made by washing with water at 55 degrees.

4. Averaging all the results, we find that the butters churned into fine granules and into the size of wheat grains contained the same per cent. of moisture, viz., 12.3. The samples churned into grains the size of corn contained an average of 14.2 per cent. moisture, or nearly two per cent. more than the butters churned into smaller granules.

5. Averaging the results of 190 and 1901, the butters without salt contained the highest percentage of moisture. In 1900 the unsalted butter contained more moisture, and in 19001 they contained less moisture.

6. There was very little difference in the amount of moisture in the finished butter, whether the working was all done at once, or whether half the working was given and the remainder given the same day, after standing three or four hours. The third working given the day after churning reduced the moisture content nearly two per cent.

7. The per cent. of salt retained by the finished butter does not appear to bear any constant relation to the amount of salt added to the fresh butter, although it increases with an increased quantity of salt added, up to a rate of one ounce per pound of butter. Butter salted at the rate of one ounce per pound of butter will lose about one-half of the salt in the process of working. The moisture pressed from butter salted at the rate of one ounce per pound of butter will contain 23 to 24.5 per cent. salt.

8. The amount of moisture retained by the finished butter depends, to a large extent upon the amount of working which it receives.

9. The amount of salt retained by the finished butter depends upon the amount of salt added, upon the amount of moisture in the fresh butter and upon the amount of working which the butter receives.

FRATERNAL GREETINGS.

During the Convention the following telegram was received from the Wisconsin Cheesemakers' Association, then in session :

"The Wisconsin Cheesemakers' Association, assembled at Milwaukee, send greetings. The Badger State cheese and butter makers predict for you a bountiful repast and a rousing Convention."

The reading of the telegram was received with loud applause, and the following message was sent in reply :

"Your predictions for a rousing Convention are being verified. In fact it has been a great success. Hoping the dairy business in which the people of Wisconsin and Ontario have a common interest may keep well to the front, we are yours in the good work."

VOTES OF THANKS.

Moved by E. Kidd, M.P., seconded by T. Carlaw, and unanimously carried: "That the Board of Directors and members of the Eastern Dairymen's Association hereby tender their thanks to the Mayor and citizens of Whitby for their kind treatment in furnishing us with so suitable a hall for holding our several sessions, for interest taken in providing proper lodging, etc., for many of our speakers and members, and for the general hearty reception given to our Association. Also that the thanks of the meeting are due and hereby tendered to the various railways for their kindness in returning our members to their homes free of cost."

The Convention then adjourned.

DAIRYMEN'S ASSOCIATION OF WESTERN ONTARIO

ANNUAL MEETING.

The Thirty-fifth Annual Convention of the Dairymen's Association of Western Ontario was held at the Opera House, in the City of Woodstock, on the 14th, 15th, and 16th of January, 1902.

The meetings were all held at the Opera House, and were well attended. At some of the evening meetings the spacious building was filled. Much enthusiasm was displayed and great interest taken in all the addresses, and the discussion was entered into by a considerable number of members.

PRESIDENT'S ADDRESS.

By R. M. Ballantyne, Montreal, Que.

I feel that my first duty to-day is to thank you for the great honor you have done me in electing me to occupy the position of President during this past year, when you knew I would not be a resident of this portion of Canada. I cannot express to you how much I appreciate it, and it has been my constant regret that I have not been able to be of more service to the Association. It is with regret that I note there has been a falling off in exports of cheese for the past year, but I am pleased to say that we have made an increase in our export of butter. From the 1st of May until the close of navigation of the past year there were shipped from Montreal 1,791,613 boxes of cheese and 410,893 boxes of butter. To the shipment of cheese from Montreal there should be added a shipment of 217,509 boxes from Portland, 14,633 boxes from Quebec, 34,000 boxes from Halifax, and possibly 50,000 from New York, making a total of over 2,100,000 boxes of cheese shipped between the 1st of May and the 25th November; and as it was estimated that there were 550,000 boxes of cheese in Canada on this date, this would give us a total of 2,650,000 as the make of Canadian cheese during the past season, against a make of 2,800,000 for the previous year, showing a falling off of 150,000 boxes during the year, but as a large quantity of milk was transferred from cheese factories to creameries in the east, our export of butter has increased, and has more than made up for the falling off in cheese. Our shipments of butter from Montreal, from 1st of May until close of navigation, were 410,893 boxes, as against 256,563 for the same time last year, showing an increase of 154,330 boxes during the season of navigation; and as the milk that will make one pound of butter will make two and one-quarter pounds of cheese, it is quite evident that the make of Canadian dairy products during this past season was greater than ever before in the history of the trade. So that, instead of having a decline in the export of dairy products, as many people believe, the fact of the matter is we have had an increase equal to 200,000 boxes of cheese; but the increase has been in the shape of butter. On the other hand, the price of cheese has been much lower than last year, and the value of the export less.

Since I have gone to Montreal I have of course seen a great many cheese from all the cheese-making sections of Canada and northern New York State. I have also seen considerable quantities of butter from the different butter-producing sections. I have had many opportunities of comparing the quality of both butter and cheese from these dif-

ferent sections, and I can say to you that the cheese of the section covered by the Western Dairymen's Association compare most favorably with the cheese of any district. I feel, and I know I am right, when I say that the cheese of the section west of Toronto (as a whole) are better cheese than the cheese of any other section in America. Of course there are exceptions to the rule, and sometimes the exceptions seem entirely too numerous, but the statement is true, nevertheless.

The points of excellence in Western Ontario cheese are : Their fine, stylish appearance, greater regularity in the make, well finished ends; and they are better boxed than the cheese of Eastern Canada ; but you have some marked defects that must not be overlooked, and one, if not the main one, is bad flavored cheese.

From observation during the past year, I am satisfied that the practice many salesmen adopt of waiting for a favorable market, has a great deal to do with it. The practice of waiting for a more favorable market is not adopted to any extent in the east, and it should not be adopted in the west. If it is adopted, the cheese that are being held are subjected to a summer temperature, which is usually a high temperature, for a sufficient time to injure their flavor, and for sufficient time to evaporate a large amount of moisture, and make the cheese dry. If the cheese are several weeks old, extreme heat, such as we have in hot spells, will melt a portion of the fat in them, increasing the condition of dryness, injuring their appearance, and causing them to develop bad flavors. I am quite satisfied that the time is coming when cheese will be handled much as butter is now handled, except, of course, that we shall not have freezing temperatures for cheese ; but we will have a cooled temperature all the time from the hoop to the retailer, and we will then have cheese from which the moisture has not been dried out, cheese that have not developed a strong rancid flavor, and, on account of the improved conditions of handling, it will not then be necessary to make the stiff dry cheese we are now making. The increased weight of the cheese alone would more than pay any expense there might be, to say nothing of the better price superior quality always commands.

The Minister of Agriculture at Ottawa has done much in past years to establish refrigerator transportation for butter, and has, during the past year, inaugurated a refrigerator service for the cooling of cheese on a number of ships sailing from Montreal. Those who have been using this service are much pleased with it. The Montreal Butter and Cheese Association have addressed a letter to the Minister, expressing their appreciation of the service, and asking that it be further extended both on sea and on land. They ask that the refrigerator service on sea be so increased as to accommodate all the cheese shipped from the port of Montreal, and they ask that icing stations be established at cheese shipping centres, so that all cheese cars may be iced in summer. The fact is, those who are engaged in the handling of cheese have come to realize very fully the importance of keeping cheese cool all the time, as a very few days of exposure to heat does an irreparable injury to them.

Western Ontario was first to make material progress, and the other portions of Canada followed. I am proud to say you still lead in methods of manufacture, and other sections follow, but after the cheese are made I believe the goods of this section suffer more from heat than the cheese of Eastern Ontario and Quebec, although the buildings of the east are poorer. Cheese there suffer less from heat because they are shipped weekly, and they do not remain long enough on the shelves to take much injury. After they reach Montreal the big cold storage warehouses protect them, and I feel that you must adopt a method of more prompt shipment in summer if you wish to maintain the lead. In the fall of the year all this is changed. Eastern cheese are seldom cured enough, and, as most dealers have no facilities for curing, these fall cheese go forward to England in a much less desirable condition than your western cheese.

A couple of years ago the Minister of Agriculture had a bill put through Parliament, giving to municipalities the power to establish cold storage plants, and I am quite certain the cheese industry would be immensely benefited by the introduction of these cold storage plants in your midst, for the curing of cheese in a properly regulated temperature during the summer season.

During the past season the Directors of your Association took upon themselves the responsibility of collecting a suitable exhibit of cheese and butter to be sent to the Pan-American Exposition, and to them is due practically the whole of the credit that Canada received from her magnificent display at Buffalo. This exhibit has been a magnificent advertisement for us, and we should derive benefits only second to those derived from the World's Fair at Chicago, but this subject will be dealt with more largely by Mr. Paget, who will make the report of the committee who had this work in charge.

Following up the start made a year ago, we are having an exhibition of cheese and butter which we believe will do much to form correct ideas of quality and methods. The judges will be asked to discuss the exhibits most fully with you, and I hope you will make use of the opportunities that will be given to get all the information you can out of them.

I think it would be well if, at the close of the proceedings, some resolutions relating to these matters were passed, especially these icing stations in different sections of the country. I do not think any greater benefit could be done to the country than to have these icing stations established. I know that cheese shipped by ourselves to England the past season arrived in the old country with wet rind, and that a great loss of money resulted.

DIRECTORS' REPORT.

Your Directors for the year 1901 beg to report as follows :

The Queen. The last words occurring in the printed report of the proceedings of our last Convention are "God Save the Queen." Immediately after the close of the Convention came the news of the serious illness, and, in the course of a few more days, of the death of Good Queen Victoria, after her long and glorious reign of nearly 64 years.

Members' Fees. It is now exactly ten years since, on the suggestion of the then President, the annual membership fee was reduced from $1.00 to 50 cents. The object sought in making the change was, first, to increase the revenues of the Association by securing a large proportion of the patrons of the factories as members, and, second, to enable the patrons to secure the literature that is freely distributed to the members. The reduction failed to secure the first object, while the second is now accomplished through the Farmers' Institutes. Your Directors recommend that the fee be $1.00.

Reports. The proceedings of the conventions of 1900 and 1901 have been printed and distributed by the Board. By this means the copies have been in the hands of the members in ample time before the opening of the factories. It is recommended that this be again done; and. further. if the recommendation regarding the fee is adopted, that bound copies be supplied to the members.

Transportation. A resolution regarding better facilities for transportation of dairy products was adopted at the convention in 1901. It is gratifying to see that the Dominion Department of Agriculture is alive to the extreme importance of the question to the dairy interests.

Chemical Investigation. A resolution urging the appointment of a chemist and bacteriologist to assist in solving the many problems that arise in the dairy business that require their aid was also adopted at the last convention. The Board appointed a committee to lay the matter before the Government of Ontario, with the result that arrangements have been made by which the staff of the Ontario Agricultural College may conduct such investigations. Prof. Harrison has made some investigations during 1901 and will report the results to you during this convention.

Pan-American and Glasgow Exhibitions. Your Board, while recommending that steps should be taken to make suitable displays of dairy products at the Pan-American and Glasgow Exhibitions, and while expressing their willingness to assist in selecting the exhibit, felt that it would not be justified in expending any of the Association funds for these purposes. The Department of Agriculture, Ottawa, attended to the Glasgow

Exhibition, while the Department of Agriculture, Ontario, appointed a committee, comprised of members of your Board, to select and make a display at the Pan-American Exhibition, the Department bearing the expenses, except that of transportation, which was taken care of by the Department of Agriculture, Ottawa. A further report on the Pan-American will be submited to you.

Instructors. The same policy regarding instructors was adopted as in recent years. They were requested to confine their work to instruction only unless specially requested by the manager to test milk for the purpose of discovering adulteration, and also not to prosecute unless so requested. They were also to discuss the best means of caring for the milk at the meetings of the patrons if any such were held on the evening of his visit. The instructors' reports will show what has been accomplished.

Your Directors have for years felt that the funds at their disposal for instruction should be spent on those who were willing to co-operate and bear a portion of the expense, and have hitherto acted accordingly. This year an exception was made in the case of the creameries, the Association paying the factory fees for the first visit, so as to enable them to see what they could gain. The result will be explained in the report of the instructor at creameries. Now that they have had the experience it is hoped that in future they will be willing to take advantage of the assistance provided, and pay the small charge that is made to assist in providing for the expenses.

The very great increase in the production of creamery butter, as shown by the exports, warrants the Directors in urging upon the creamery men that they should use every means available in improving the quality and further increasing their production.

Thanks. The thanks of the Association are due to the Grand Trunk Railway and to the Canadian Pacific Railway for granting a concession that has long been wanted, and the want of which has caused much inconvenience in former years, the granting of free tickets for the return trip without any guarantee as to numbers.

The thanks of the members are also due to the Canadian Salt Company of Windsor for their donation of the very beautiful members' badges for the convention.

One Day Conventions of Patrons. It is recommended that, during the month of February, a series of meetings of patrons be held in centres of dairying. There are many places at which such meetings could be held with advantage, but which have not accommodation for holding the Annual Convention. The third day of this convention is to be considered the first of the series, and is somewhat of the nature of a venture, but one which is thought should be made successful.

Programme. During this convention subjects will be discussed of the greatest importance. No effort was needed to think of subjects for discussion. They came without asking. They are live questions, and appear to your Board to cover the whole dairy business : (1) The supply of raw material to the factories; (2) buildings and equipments; (3) skilful makers; (4) the care of the product; (5) the marketing of the products; (6) its transportation ; and there you are. These subjects will be all before you, and it is to be hoped they will be thoroughly threshed out in discussion.

Grants to Fairs. Your Directors made the usual grants to the Industrial and Western Fairs. In this connection it is pleasant to report that one of your representatives, Mr. A. F. MacLaren, M.P., has been elected as a member of the Board of the Industrial Fair. Through Mr. MacLaren the great dairy interests will be carefully looked after at the Industrial.

All of which is respectfully submitted.

God Save the King.

The President : Mr. Harold Eagle suggests that I should mention that the $1.00 fee would cover a bound copy of the Annual Report, and that a fee of 50 cents would pay for a paper cover report.

Moved by the President that the report of the Directors be adopted.

Mr. Goodhand : In rising to second the adoption of the report, I desire to say that the Directors of the Industrial Exhibition, Toronto, have made a grant of sufficient money

to erect a suitable building for dairy exhibits at that Fair. This has been due mainly to the influence of our Director on that Board. We will have better accommodation there in future, and we, as dairymen, can offer them our congratulations. We hope that they will put up a building where we can have the accommodation that we have not had in the past, and so that we can go there and enjoy ourselves while examining the dairy products of this country. The motion was carried.

FINANCIAL STATEMENT OF THE DAIRYMEN'S ASSOCIATION OF WESTERN ONTARIO FOR THE YEAR ENDING DEC. 31st, 1901.

Receipts:		
To bal. from previous year.	$ 1,073 69	
Membership fees	186 00	
Legislative grants	4,000 00	
From prosecutions	27 50	
Factory fees	828 75	
Outstanding from 1900.	53 88	
Total receipts		$ 6,169 82

Payments:			
By grants to other societies		$ 150 00	
Cash paid for prizes....		318 00	
Convention expenses ..		561 27	
Officers' salary		360 00	
Directors and committee meetings		329 10	
Printing and postage of Annual Reports		153 00	
Printing and stationery.		50 74	
Postage		43 76	
Instructors' salaries and expenses:			
Jas. Morrison	$1,028 00		
Jas. Bristow..	610 00		
Arch. Smith..	1,145 75	2,783 75	
Instructors' supplies ...		4 00	
Reporter		70 00	
Cheese & Butter Makers Association		100 35	
Liabilities outstanding for 1900		221 97	
Membership fees retur'd		1 00	
Total payments			$5,146 94
Balance on hand...............			$1,022 88

Mr. J. N. Paget, in moving the adoption of the report, said: It gives me a great deal of pleasure to move the adoption of the report. As you will see by the report of the Secretary-Treasurer, the Directors of your Association have handled considerable money during the past year, and you will also notice that the greater portion of that money has been spent in instructing cheese-makers, not only in these factories, but instructing the producers of milk. The Association has been directing their attention more along that line during the past few years than ever before, and we realize more and more every year that that is the great and important matter that we ought to instruct upon. The men who are producing milk from which the cheese and butter is being manufactured, are the people who need instruction. We have endeavored to economize in every way possible during the year, and I have very much pleasure in moving that the report of the Secretary-Treasurer, as read, be adopted.

Mr. Harold Eagle, in seconding the adoption of the report, stated that it gave him a great deal of pleasure to do so. He felt that the funds of the Association had been well handled, and that every dollar had been placed where it would do the most good.

REPORT OF INSTRUCTOR JAMES MORRISON.

I take pleasure in presenting to you my fifth Annual Report.

District. The district in which I was employed was the same as last year, namely., the Counties of Oxford, Norfolk, Brant, Haldimand, Lincoln, Welland, Wentworth, Halton, Peel and Waterloo.

Applications. I received application from 37 factories for 137 visits. Of these I attended to 127, and Mr. Bristow kindly made three visits for me. The others, on account of the small make, and not being able to visit them earlier in the season, were cancelled.

Term. I commenced work for the Association on the 30th of April, and finished on the 4th of November. Applications were also received from ten factories for fourteen meetings of patrons to be held in the factories in the evening. I attended to seven of these; three were not held on account of notice not being sent to patrons in time; one on account of rain, and the others were applied for too late in the season to get the patrons to attend. These meetings are the means of a great deal of good when they can be held early in the season, in May or June, or before the patrons commence haying ; after that time it is impossible to get a good attendance. In fact, it seems to me that the patrons who need instruction the most are the ones who are hardest to get to attend a meeting of this kind. At the meetings held there was always a good attendance, and some lively discussions arose on the feed and water for cows, and milking and care of milk. Some patrons admitted that they did not think it was necessary to strain the milk at home, as it would all be strained at the factory. I am satisfied these meetings had good results to many of the patrons who attended them, causing them to put into practice some of the things brought out in the discussions which they would not otherwise have done. In many of our factories now the makers are doing good work with the milk that they receive. What we need so as to improve the quality of our cheese is to get a better class of milk delivered at the factories. I am satisfied this can be done in many cases by having some one to address the patrons on the care of milk at their annual meetings or at meetings held at the factories early in the season. In my opinion this should be the principal part of the instructors' work next season through the months of May and June.

Milk Testing and Prosecutions. I tested 5,151 samples of milk with the Quevenne Lactometer, and 2,860 with the Babcock Milk Tester. Of these samples I found 47 had been tampered with. I warned 21 of these patrons personally and 18 by letter ; the others were warned by the owners or Directors of the factories. Two patrons, besides the warning they received, were assessed $3.00 and $5.00, respectively, as damages to the factory. These warnings with some patrons may be as lasting as a prosecution, but in many cases it is of short duration, as they are only waiting until they think it is safe or until after the inspector has visited the factory, then they return to their old practices again. Such patrons should be not only prosecuted, but expelled from the factory. But until the makers will all agree not to accept milk from any patron who has had his milk rejected at a neighboring factory, just so long will the patron who feeds turnips or tampers with his milk get in his dishonest work.

Paying by Quality. Eight of the factories visited this season were paying for milk accordng to quality. I know of no better way of having milk cared for, or honest milk sent to the factory, than to pay each patron according to the quality of the milk he sends. In testing the composite samples of milk at some of these factories I found that many of the patrons were very doubtful about the reliability of the Babcock tester in being able to determine the per cent. of butter fat in the milk, but many of them are soon convinced by an explanation or by having them watch the operator while testing. I am fully convinced from what I have seen during the past season that the patrons take better care of their milk in every way, in cooling, airing, and stirring, so as to get the highest test possible for their milk at the factory, and do not take that little pitcher of cream for porridge, tea, strawberries, and such like (we so often hear about), as many do where the milk is pooled instead of paying by quality.

Factory Buildings. Many of the factories now are in fair conditon for cheese making; many of them are much improved from what they were a few years ago. No doubt there are some old factories that cannot be fitted up as they should be until they are replaced by new buildings. Ninteen factories had ice to use in controlling the temperature of the curing room, two factories had sub-earth ducts. Of the two systems I would prefer the sub-earth duct, as there is a better circulation of air, and the cheese are not so liable to mould. Neither system, as used, is perfect or will keep the temperature low enough in a continuous spell of warm weather.

Whey and Whey Tanks. The majority of the whey tanks at the factories are kept cleaner than they were a few years ago, still there is room for improvement in many cases. Thirty of the factories visited return the whey to the patrons; at five factories the whey is fed at the factory or drawn a short distance away and fed there; at two factories part of the whey is fed at the factory and the balance is returned to the patrons.

Curd Mills. Most of the factories where a power curd mill is used have the Barnard mill, which does first-class work when the mill is in proper shape, but many of them which have been in use for some years are in very bad shape, caused in some cases by running too fast and straining the mill. In others, the boxings on the shaft having worn out, it does not force the knife all the way through the curd, leaving enough curd uncut at each stroke of the knife to cause the curd to topple over in the box, which causes it to be cut up much finer than should be. Some mills will not feed themselves without the operator forcing the curd down into the box; all that is required is to brace the mill so it will remain solid when running, tighten up the boxings and lengthen the shaft so as to cause the knife to cut clean through the curd at each stroke.

Washing Curds. More of the makers have practiced washing curds this last season than formerly. Unless with a very fast working or sour curd I would not advise washing at dipping as with an ordinary working curd. It is apt to check the acid too much, causing the curd to be loo long maturing. To wash after milling, with six or eight pails of pure water, at a temperature of 94 to 100 degrees, according to the season or to the temperature of the room, will give good results in expelling white whey and flavors, and also gives the curd a silkier feel. As washing of curds tends to weaken the body of the cheese care must be taken not to salt too early, as this has been the means of a great many open cheese.

Bitter Milk and Flavors. The trouble from bitter milk seems to be spreading into new sections or to factories where it has not existed before last season, while in some factories where it caused a great deal of trouble some years ago it has been agreeably absent altogether last season. But Prof. Harrison will deal with this subject, and I hope the makers will discuss it thoroughly with him to find out the cause, and also the means to prevent it in future.

Quality of Cheese. I found many of the cheese early in the season, in June and first part of July, were of a coarse, harsh texture, caused in many cases by allowing the acid to develop too much in the sink. Curds that are not well cooked, or firmed up at the time of dipping, require a great deal more stirring when dipped than a well cooked curd. This was not always done, leaving too much moisture, and causing the acid to develop very rapidly; in many cases not enough to hurt the color, but spoiling the texture. Later in the season the cheese were of much better quality, although in some factories the cheese were weak and open, caused by too much moisture, light salting, and not maturing enough before salting. The milk, being richer in the fall, giving a better yield of curd and retaining more moisture in the curd, requires more salt than is often used to give body to the cheese.

In conclusion, I would recommend the makers to be very particular regarding the quality of the milk received next season, and accept none but what they can make into first-class cheese. Only in this way will we be able to uphold the reputation we have maintained at the Pan-American and other fairs open to the world. Also to keep on improving our factories, and on no consideration to accept milk rejected by another factory for any cause whatever.

REPORT OF INSTRUCTOR JAMES BRISTOW.

I take pleasure in presenting to you my first Annual Report as instructor at cheese factories for the Dairymen's Association of Western Ontario.

District. The district assigned to me comprised the Counties of Elgin, Middlesex, Essex, Kent, Lambton, and parts of Huron, lying south of the Buffalo and Goderich division of the Grand Trunk Railway.

Applications. Applications were received from 24 factories for from one to five visits each; also from three factorymen wishing to hold meetings of their patrons for the purpose of discussing the best methods of caring for milk so that it might be in the best conditon for cheese-making.

Term. I commenced my duties on the 9th of May and finished on October 18th. I spent seventy days at cheese factories testing milk and giving instructions in cheese-making.

Milk Testing. At the different factories I tested 4,082 samples of milk with the lactometer and 406 samples with the Babcock tester. I found 26 samples of milk that had been tampered with. Twenty-four of the patrons from whose milk these samples were taken were allowed go with a warning and the other two settled with the company.

At two of the factories I visited there was no Babcock tester. At one factory they paid for the milk according to the quality, and the system seemed to be giving very good satisfaction.

Making Rooms. Speaking of the making rooms of the factories I visited some were first-class buildings and kept in good conditon, but quite a number were far from being first class. The principal defects were poor buildings and bad floors, which allowed the whey and wash water to leak through, causing a bad odor around the building.

Curing Rooms. For the purpose of controlling the temperature in the curing room the most of them have ice boxes, and at three of the factories I visited they had sub-earth ducts, and at six factories there was no means whatever for controlling the temperature of the curing room. At one of the factories, where there was no provision made to control the temperature of the curing room, I have seen the thermometer register 91 degrees. In such a room as this we cannot expect to find a fancy quality of cheese. I would strongly recommend all factorymen to provide some means to control the temperature of their curing rooms in hot weather.

Whey. At two of the factories visited the whey was fed at the factory, the remainder of them returned it to the patrons in the cans.

Whey Tanks. Most of the whey tanks at the factories were elevated, and were kept fairly clean, but a few still have them under ground, and are not, in a number of cases, kept very clean, as it is almost impossible to keep these underground tanks clean. I would advise factory managers to elevate their tanks, so they may be easily cleaned, for I think that a great many flavors with which cheesemakers have to contend are caused from filthy whey tanks. The makers should insist on their patrons emptying their cans as soon as they are returned, and have them well washed and scalded, also well aired, before putting the milk in them.

Before concluding my report, I would strongly advise makers before starting in the spring to see that the floors, vats, and everything about the factory are in proper condition, and keep them so throughout the season, and by doing so you will be fully paid for your labor.

REPORT OF INSTRUCTOR ARCHIBALD SMITH.

I herewith present to you my third Annual Report as instructor at cheese factories and creameries.

The northern district was alloted me for cheese factories and all western Ontario for creameries.

I spent 124 days giving instruction at 71 factories, and also addressed 50 meetings of farmers who were furnishing milk to the various factories.

Three persons were fined from $10 to $25 and costs for furnishing adulterated milk and one settled with the Directors of the factory by paying $7.

Unfortunately, we cannot claim any improvement in the quality of the cheese made in Western Ontario this season, partly owing to the very hot weather during the summer and also to the poorly constructed curing rooms and unsanitary condition of some factories, but more particularly to the condition of the milk delivered by the farmers, owing to its being very poorly cared for at home.

The curd test is one of the cheese-maker's best friends, and should be in use in every factory. They can be purchased for about $5, and I would advocate using pint sealers instead of bottles with wooden corks, as it is the most effective means of detecting bad flavored milk. I used it this year at nearly every factory I visited. and very seldom used the Babcock test. It is of more importance to the dairy industry of this Province that the farmers be prevented from furnishing bad flavored milk, which causes such a serious loss of reputation and money to the makers and other patrons than that a few farmers be prosecuted for adulterating their milk.

The creameries were all visited once free of charge. which was much appreciated by the butter-makers. It is apparently the only way by which we can reach them and assist them in their work of improving the quality of our butter, and I would urge a continuance of the system adopted this year.

The system of holding meetings was highly commended by nearly all of the makers in my district, and the fifty meetings which I addressed were (with the exception of a very few) very well attended, and the second meetings were usually much better attended than the first, owing to the fact that the farmers became better acquainted with the objects of the meetings and more interested in improving the quality of the cheese and butter. In districts where dairying was the chief source of revenue for the farmers they turned out in largest numbers, but in other districts where dairying is only a side issue it was a more difficult matter to reach them.

Our butter at present enjoys a fairly good reputation on the British market, but there is still much room for improvement, more particularly in connection with the cream gathering creameries, which produce immense quantities of butter, which is frequently held in unsuitable storages for too long a time, and the flavor is spoiled before it reaches the market. One of the chief defects in the butter is excessive moisture, and poor keeping quality, which is largely due to the care the cream receives at the farmers' home, the high churning temperature, and lack of skill on the part of the maker.

Where the temperature of the storages at the creameries cannot be maintained below 38 degrees Fahrenheit the butter should be shipped out weekly and consumed while it is fresh. A number of creameries have well constructed storages and have received the Government grant, but only a few of them are now using sufficient ice to keep the temperature low enough.

Methods of Improvement. In order to improve the quality of Canadian cheese and butter we must encourage the farmers to make a specialty of dairying instead of a side issue, and devise some efficient means of reaching the farmers and induce them to improve on their methods of caring for milk and cream, and deliver it at the factory in a condition that will enable the makers to handle it to the best advantage, by illustrating to them the enormous losses sustained by themselves and other patrons by following their present methods, and the serious injury to the reputation of the maker, the factory, and the dairy industry of the Province. We must renovate the old buildings and build better

curing rooms and storages, in which the temperature can be controlled, also improve the equipments and insist on better sanitary conditons. Employ more skilled makers at better salaries and endeavor to keep the best men in the business, pasteurize the whey, or, better still, stop returning it to the farmers, and send the can home clean. Encourage the holding of local cheese and butter exhibits, where the makers could meet and have their goods scored by expert judges, who would explain in detail their defects and offer suggestions for improvement. This would serve to educate the makers in the requirements of the market and stimulate them to do their best. Try and induce every maker to take a course at a dairy school, also to join these Dairy Associations; attend the conventions and profit by whatever suggestions and instructions may be offered.

Discourage the existence of small factories and encourage the building of larger ones. Study carefully the profits of dairying and the best methods of carrying on the work, both from a farmers and makers standpoint.

A sufficient number of instructors should be employed to visit every factory in the Province as often during the season as is necessary to insure a uniform and good quality of goods. They should be given authority to enforce better sanitary conditions, and report the work of careless and incompetent makers, and instead of using the Babcock test and lactometer to detect adulterated milk, the curd test should be used more to detect bad flavors.

More time should be spent in addressing farmers' meetings and illustrating to them in a practical way the condition of the milk or cream as delivered at the factory, and the effect on the quality and value of the products and the necessity of greater knowledge in the production and care of milk and the requirements of the market.

Makers should unite to protect themselves, and the farmers who furnish good milk, against those who do not; and practice to a great extent the doctrine of co-operation, which means that each works for the benefit of all, and all work for the accomplishment of one object—the improvement of the quality of our cheese and butter, that we may be able to compete successfully with the products of other countries, and that our dairymen may receive the greatest possible revenue for their work and encourage them to engage more extensively in the business.

After the appointment of a committee, consisting of Aaron Wenger, James Connolly and J. N. Paget, to receive applications for one day meetings, the discussion of the inspectors' reports was taken up.

Mr. Publow : I would like to ask the instructors whether there was more need for instruction to the patron or instruction to the cheese-maker.

Mr. Smith : Throughout Western Ontario the conditions are different to what they are in the east. We have much larger factories and fewer young makers, but we find we have just as much difficulty in getting as good quality of milk as they have in Eastern Ontario, and we believe there is more necessity to educate the farmers along these lines than there is in educating the makers. My own view of the question is this that so much time need not be spent in educating the farmers as we sometimes think, but that this question of improving the quality of milk lies very largely within the hands of the makers themselves. If there was just a little more co-operation on the part of the makers, and not so much strife and competition, it would be a comparatively easy matter to secure better quality of milk. If the makers would only agree not to accept any milk that had been refused by another factory on account of bad quality, it would then only be necessary to inform the patron that he had to take better care of his milk and he would do so. At the present time they tell you they can go some place else with their milk, and you are almost at their mercy.

Mr. McFarlane : Does every cow's milk make as good cheese when it goes to the factory ?

Mr. Smith: It depends on the quality of the milk, the amount of butter fat, and the flavor. There would be just as great difference in different cows' milk as there would be in the different curds. No doubt every cow would give good flavored milk if she was in good conditon, and if it was well taken care of after milked.

Mr. McFarlane: Can you give us any experiments on that?

Mr. Smith: That is something we do not experiment on. I can see no reason why there should be any difference. It will make just as good quality of cheese if it has the same amount of butter fat and is well taken care of.

Mr. McFarlane: No, it won't.

CHEESE-MAKING.

By G. G. Publow, Eastern Dairy School, Kingston.

I am to speak to-day on the difficulties or the causes of the irregularity in the quality of our cheese. From some observations I have taken I find that it is due entirely to a lack of knowledge, on the part of the makers, of the principles of cheese-making; not so much how to do things as why they do things. That is, they do not understand why they should use rennet, its action, the effects of moisture, and the effects of temperature, and the effects of salt.

Now we find in cheese-making that the factors that produce quick-ripening, or fast curing, of cheese are these: Milk with high acidity, large quantity of rennet, excessive moisture, low salting, and high temperature of curing. These combined produce soft cheese, fast curing, with poor keeping qualities. The factors that we find producing long keeping cheese are, sweet milk, smaller proportion of rennet, higher cooking, larger or greater amount of salt, and lower temperature for curing.

Makers should understand these things, but we find that 50 per cent. of those who come to the Eastern Dairy School do not know anything at all about them. They have been taught how to cut a curd, how to cook it. and how to stir it, but not why they do these things. And this, I claim, is the reason of the irregularity of the cheese we find in our section. Now, if you know these things, what will you do in the spring of the year? Have high acidity in the milk at the time of adding the rennet, use more of it, cook a little more to insure moisture, use a little less salt and have a little higher temperature, and that will insure your cheese fit for the market early. I cannot lay down any cast-iron rule for making the spring cheese, other than that you will have to educate yourself and watch the market, and if the market is poor in the spring, no cheese, they will require cheese of that character that will be ready for consumption at an early date, and you will have to govern yourself accordingly. If the market is loaded with cheese, they do not want cheese to be ripe quite so early, and that means we must make the cheese in such a manner that they will not be ripe quite so early.

Now, the object in cutting the curd is to facilitate the expelling of moisture. That is why we cut the curd. It should be cut in such a manner that it will expel the moisture uniformly; that is, every piece of curd should be of the same size, if possible. If you understand the principle of cutting, you will be able to control the curing and its action. We find the acid is developed in the curd, and not in the whey around it. If we have fast working milk, we should cut the curd finer at the start to let the whey out; and, if the milk is sweet and working slow, we should cut the curd larger, so as to retain the moisture, and so as to have the right acidity by the time the curd is firm enough.

The cooking of curd requires the same attention. The curd should be cooked in accordance with the fermentation. That is, if the curd is shrinking rapidly it should be cooked rapidly, if it is shrinking slowly it should be cooked slowly. Makers must educate their sense of touch, so that they can tell by the feel of the curd, or touch, in what manner it is going on. Some cheese are injured from the lack of cooking. You

should have the right body by the time the right amount of acid is developed. You pay too much attention to getting it cooked up to 98 or 100 degrees, regardless of body or texture, and then try to remedy the defect by rough stirring afterwards. Unless you have the texture of the curd right by the time you have got enough acid you cannot make it fine afterwards. You can make it dry, but you will make it hard and coarse in grain by excessive stirring. The acid, I said, was developed by the amount of moisture in the curd, and the temperature attained. It is important then that we should know when we have the right amount of moisture for the acidity we have in the curd. The more moisture you take out, the more acid is developed. We find that you want to have a certain amount, with a certain dryness, to give a certain character of cheese, that is, a cheese that will be silky—firm and yet silky. The milling of the curd is done so as to get the salt evenly distributed. It should be done in such a manner that it will be uniform. Salt is added to the curd to give flavor and texture, or body, to the curd. It retards the action of rennet, and, in so doing, it lengthens the keeping quality, and if we realize that we will use a smaller proportion in the spring and as the season advances we will increase that; and as the milk increases in fat we will increase it. In cooking the curd some thought must be taken of the amount of fat in the milk. We find in our work that moisture is retained in proportion largely to the amount of fat. That is, in cooking the curds we have to cook a little higher and a little longer for rich milk to get the same body and texture in the cheese, and we also have to use a little more salt in proportion to the fat. In following out these principles we find we have no difficulty in making a cheese uniform throughout the whole season, and if makers will think more along these lines, and study why they do things, and do them accordingly, there will be a more uniform quality of cheese in the country.

Mr. Millar : I have been delighted with Mr. Publow's address. There is one point I would wish to impress upon this audience, and that is the question of cooking the curd. I think a great many of our cheese are spoilt in the vat. I would like to ask Mr. Publow what is the chief cause of hard, dry cheese ?

Mr. Publow : Lack of moisture in the curd at the time the right acidity is developed. Lack of moisture in this way, that is either cooked out or stirred out—generally stirred out. These dry, hard cheese are usually made from the curd being over dry, cooked fast and then stirred excessively after the whey is removed.

Mr. Millar : That might be caused by the use of a starter when it was not necessary.

Mr. Publow: Yes. I give time enough for the moisture to be expelled naturally from the curd. It is more likely to be caused by stiring than cooking.

Mr. Bell : Do I understand from Mr. Publow that he would advise giving it a lower temperature in the spring ?

Mr. Publow : Yes; I usually give a little lower for this reason, that there is less fat in the milk. We find we must have the fat or moisture to make the cheese mellow. and we cook a litle lower. Sufficiently high just to have the curd firm, that is not hard and stiff, but just lively at the time you get acidity enough developed; then you will have a nice body and texture in the spring cheese.

A Member : What temperature do you cook at ?

Mr. Publow : All the way from 92 to 96 degrees. Sometimes I find the curd sufficiently hard at 92 degrees, other times 96 degrees and some times 98 degrees. I do not believe in cooking any higher than will just get the curd properly firm, so that it will mat well afterwards, and enough moisture out so that the acid will not develop too fast in the vat.

Mr. Bell : We find in our experience that it is a little dangerous to advise cooking low in the spring on account of getting too much moisture, and therefore have too much acid developed at the time they are ready to go. They should go at ten days old, and we find in our experience that cooking up to 98 degrees is best.

Mr. Publow : You should use good judgment in the matter. In the east, if the makers cook high, they are apt to get rather strong cheese, a little too dry. They seem to get the moisture out in the stirring, and they come too slow and the cheese are

inclined to be a little leathery and open. If you get acid enough developed you will get cheese so that they will break down. In my section makers are inclined to get them a little too dry in the spring.

Mr. Bell : What about using an extra amount of rennet to overcome that dryness.

Mr. Publow : The more rennet you use the quicker the cheese will cure, and perhaps it is the safer way to use a larger amount of rennet. Where a man lacks experience it would be a good way.

A Member : Is it an established fact that rennet has effect upon the curing of cheese. Personally I think it has.

Mr. Publow : I used to be of the opinion at one time that it had, but I am rather losing faith in that. We want to stick to what we know to be right till we prove it to be wrong. I believe makers are a little too afraid of using rennet. I was of the opinion at one time that rennet had an important influence over the cheese.

A Member : In September we had a lot of tough, leathery cheese. They said you would think by the feel of it that you could take a block off and almost double it before it would break. I would like to know the cause of that.

Mr. Publow : You did not have acid enough developed for the amount of moisture you took out, or you cooked it too much, or cooked it too high, and that made it tough.

A Member : Would not that be caused by not having sufficient heat in the curing room ?

Mr. Publow : I do not think so.

A Member : That cheese was made under the same conditions as cheese made previously and always at the same temperature, why should it make a difference for that one month ?

A Member : There is another reason that I think ought to be taken into consideration. The acid and the cooking are no doubt two main tendencies in making the curd dry, but oftentimes, after the curd is dipped and put into the sink, it is exposed too much to the atmosphere, and that curd becomes too dry. It is turned over and over and not covered, and oftentimes I have noticed curds that were all right when taken out were allowed to get too hard simply by evaporation in stirring.

Mr. Alexander McKenzie : This question of salting rennet and acid is very important.

Mr. Morrison : Mr. Publow talks about their cheese being dry. I would like to know how much salt they use.

Mr. Publow : We use about two pounds up to the 10th May. From the 1st May until about the 10th, and we gradually increase and rise, in the month of June to two and a half pounds, and keep that up till the latter part of August or first of September, and then we increase to about three pounds, using good judgment as to the amount of moisture. If the curd was dry in the spring, and we saw that it lacked moisture, we would not put on quite two pounds. We salt in proportion to the moisture in the curd and the fat in the milk.

Mr. Morrison : I find a great many of our makers in the west use about one and a half pounds of salt in May, and increase that to about two and a quarter or two and a half through June and July, and some of them never get over two and a half pounds. I think a great many of our fall cheese are hurt a good deal by lack of salt. I would like to hear from some of the older makers on that point.

Mr. Publow : Probably the circumstances are different in the west. I understand you use curd sinks or racks. In the east they are using mostly the pan. Curds on the rack will drain out and be drier.

The Chairman : Since going east, I may say, I have formed an opinion upon late fall cheese different from any I ever had before, and my opinion is this. and it is based largely on the practice of the section east of Montreal, where the milk is much richer than it is west. In the eastern section they cook their curds nearly all above 100 degrees, and some up to 104 and 106 degrees. 102 degrees is a very common temperature in Quebec, and I have come to the conclusion that our late fall cheese, that had that leathery character, was caused largely because the temperature was not sufficient in cooking these

late fall cheese from rich milk. That is simply a theory of my own. I have had no practice, and I do not know whether the instructors will be able to give you any information upon that point.

Mr. Alexander McKenzie : I was in a factory last fall where the cheese were apparently all right, but they had that leathery texture. I attributed it more to the lack of heat, but it might not be caused by that.

The Chairman : Late fall cheese of this section that have been objectionable, have not been cheese that have been hard, but cheese that have been soft. If they happen to be colored cheese they generally lose their color before mid-winter. If they were a white cheese they would lose flavor, and probably get soft, pasty cheese to a great extent.

Mr. Alexander McKenzie : Was that not caused by not airing enough, that is piling the curds and leaving them in that way.

The Chairman : In the late fall they keep them covered up and pile them up to keep them warm.

Mr. Millar : Is that condition not due to the lack of development of acid in the curd ? In the fall of the year the acid develops very slowly. I think it is due largely to the curds not being cooked properly and lack of acid. If you use sufficient acid and handle the curds properly you would have none of that trouble.

Mr. Publow : Acid develops in the cheese from the moisture there. The acid does not stop when you put on the salt. as some makers think. The acid goes on, and that is the reason why these colors get out in the fall. Cook the curd sufficiently long to be lively. It will take longer time and higher temperature in the fall when the milk is rich to bring that about and remedy that evil.

Mr. Alexander McKenzie : Would not it have the same effect by retaining more moisture in the curd ? Would not they get color as quickly as too much acid ?

Mr. Publow : That is the reason you get too much acid from the moisture. You draw off the curd with an inch of acid and have it acid cut at the time of milling. The secret of making cheese is to have the right body in the vat, have the right amount of moisture. You want good body, and you must have the right amount of moisture at that time.

A Member : Is cheese usually harmed by too much acid after dipping out the whey ?

Mr. Publow: Not very readily spoiled there, provided there is not too much moisture there, that it is dry enough. There is not too much danger of giving too much if we have the curd sufficiently dry. Of course, you can make the cheese a little meally by over ripening at that time. but there is not much danger unless you have a soft curd.

Prof. Dean : Why not use the alkaline test ?

Mr. Publow : We are using that now. I carried on the road with me last year the alkaline test with very satisfactory results. We found that the proper amount of acid in the milk at the time of taking rennet is about 2-10ths of one per cent., and in drawing off the whey I draw about the same amount. If the curd was a little dry I use 1-100th more. If there had been a starter used, and the curd worked a little fast, I used about 1-100th less at the time of removing the whey. At the time of salting I tried to have about one per cent. of acid. I find that going back over these factories where the makers were using that the cheese were invariably uniform.

A Member : Where do you get your test in the curd ?

Mr. Publow : From the dripping of the whey. That seems to be more reliable than our sense of taste or touch.

Prof. Dean : I consider the alkaline test in cheese making a very important test, just as important as the rennet test or hot iron test. No cheese maker is up to his business to-day unless he uses the alkaline test to show him how much acid there is in the curd. In western Ontario the makers do not use that test In eastern Ontario and in the Province of Quebec there are some makers relying altogether on the alkine test. I believe it is a test which our cheese makers ought to know how to use, and, if they are going to make a uniform quality of cheese the alkaline test is almost a necessity,

A Member: If the curd has sufficient acid and has not the body in the vat would Mr. Publow advise leaving it there until it has sufficient body?

Mr. Publow: You mean would I draw the curd off soft and not have pull enough on my hot iron? No, I would not. We have learned largely by the alkaline test that the acid develops in the whey in the curd and not in the whey around it. The whey around the curd will not sour the curd any more. I would rather have it in the whey till I got a body. I would not draw it out soft. I would firm it in the whey sufficiently firm that it will not mat or run together, and then you will not require to handle it so roughly. We used to think that when it pulled a quarter of an inch of acid we had to take it out. That is not the case. We find we can make better cheese by keeping it in the whey and getting it firm. Do not take them off soft or then you will not make these soft meally cheese. The whey around the curd will not sour it any more, and you have the temperatur to keep it warm.

Mr. Alexander McKenzie: How far would it be safe to leave the curd in the whey? I have seen it draw out three-quarters of an inch in the whey and the cheese would not be soft, but they would never be fine in texture, and that is just why we ripen the milk to a certain degree of acid before adding the rennet, so that you will get the proper amount of moisture out by the time the acid develops to give it the right texture.

A Member: Just when the curd is working fast is it right to run down or wait and add water?

Mr. Publow: Yes, we do that in a fast curd, where the water is good. It is a good way to do.

Mr. T. B. Millar: Do you know that we are getting on dangerous ground right there. Would it not be better to set this milk sweeter, and not take chances of spoiling your texture and color with excessive acid? I think a good many of our cheese makers accept milk that ought to be rejected. Would it not be better for the makers and patrons and for the industry to reject this milk or insist upon its patrons supplying it in a better condition?

Mr. Publow: Yes.

Mr. Millar: With regard to the starter, I think it is an evil for six months in the year. There is a time we need it, but a great many of our cheese makers are using starter when it is doing more harm than any other one thing in connection with the business.

Mr. Publow: The tendency has been to get the cheese soft. The makers ripen the milk and it is a mistake. If there is any one thing in the system that is responsible for the poor quality it is over ripening of milk, and, say what we will to them they will persist in having the milk too ripe when it is set. Now the rennet test or the alkaline test is used for the purpose of finding out the amount of acid in the milk at the time of setting. We find that to get the most cheese out of the milk and to get it of a fine texture, you must have it sweet enough that it will give you time to handle the curd carefully. It would take about three hours. If it is working faster than that, we consider it over ripe. I would never use a starter in milk if I could get the milk to work of its own accord, that is if it worked reasonably fast. I would rather wait an hour and a half in the morning than go to the bother of making a starter. I will say this regarding starters. While they are beneficial in some instances, there is more damage done by them than there is good. Do not attempt to use a starter unless you understand the proper flavor it should have, and how to make it, and how to keep it after.

A Member: Do you not think that gas will form in the milk if you allow it to stand too long waiting for it to get ripe enough to set?

Mr. Publow: Yes, if it was very dirty, that would be a case in which you would need to use a starter, and that would be the only case. I might say here for your information that on some days at the school when we are carrying on that work of ripening the milk it has not occurred in five instances that the milk thickened up before it ripened. In cases of that kind of course starter is beneficial.

A Member: In cases where the gas is bad, do you not think it would be best to use a starter?

Mr. Publow: Yes. If I was in a factory making cheese where I had trouble with gassy curds, I would recommend the use of a starter, using it intelligently, but be sure to get the starter of a good flavor and be sure that it is clean. And I would recommend that you send and get pure culture from some of the sources we have to-day in Canada, either Guelph or Kingston, and make them according to the directions, and use them according to the directions.

A Member: Why is it that you have a greater degree of acid in the fall when you put in the rennet than you have in the summer? The same degree as shown by the rennet test will not work the same in the fall as in the spring. While I have a theory of my own there may be some who would like to know the reason.

Mr. Publow: Largely because you take more moisture out of the curd on account of the milk being richer. The acid develops from the amount of moisture in the curd. If you take out more moisture it will come on slower, and you develop more acid. In the fall you take out more moisture, and of course you can develop more acid or else it will come slower.

A Member: The theory I had was this, that there are two kinds of acid that work in the milk. The one is a lactic acid, and the other is an acid that the milk takes in from the atmosphere, a germ that is in the atmosphere. that it absorbs in the summer time when the milk is hot. The hot milk absorbs more of this acid germ that is in the air. In the fall the milk being cooler when it is brought to the factory it does not absorb that, and you have to depend almost altogether upon the lactic acid for the rennet test, and that lactic acid works slower than any other acid, and you have to use more rennet.

Mr. Publow: That would be a question for Prof. Harrison.

Mr. Alexander McKenzie: What would cause milk to thicken before it would ripen up for setting?

Mr. Publow: It must be due to some undesirable fermentation which overcomes the lactic acid. You will find this milk will thicken up and will be sweet. I cannot tell what it is due to, but I believe it is due to some filth germ.

Mr. Alexander McKenzie: I have a case before my mind now where I have seen milk in the can thick on the top and still sweet. Why should that be?

Prof. Harrison: The probable reason for the thickening in cases where there is no acid developed is that you may have present alkaline bacterium, which instead of producing lactic acid produces an alkali. Personally, I have never seen a case of thickening without a production of acid. There are usually so many lactic acid bacteria present in milk that they are sufficient in number and strong enough to overcome any alkaline ferments that may be present, but there is a possibility of alkaline ferments getting the upper hand in what may be termed the struggle for existence among the bacteria in milk. and in such cases you may get the thickening without acid.

Mr. Alexander McKenzie: I can understand milk getting thick in the bottom of a can and being on the top perhaps fairly sweet, on account of filth germs or something like this, but when you find milk in the top part of the can thick and the rest sweet, it would puzzle a man who is not a chemist.

COLD STORAGE FOR HOT WEATHER CHEESE.

By Prof. H. H. Dean, O.A.C., Guelph.

During the past four years we have been carrying on experiments in order to find out what is the best temperature in which to cure cheese. We started out with two principles before us. First, we say Canadian cheese is being cured at too high a temperature for the best results, and, secondly, the lower the temperature at which we can get the curing process to take place the better will be the quality of the cheese.

These are the two principles we have had in front of us for the last four years, and I wish very briefly to bring before you the results of our work in this connection.

In 1898 we made experiments in curing cheese at 60 degrees, 65 degrees and 70 degrees. The cheese cured at 60 degrees lost 2.4 of their weight in curing in one month; 65 degrees lost 3.8, and that at 70 degrees lost 4.3. These were small cheese weighing about thirty pounds. A prominent buyer who scored a number of these cheese said the cheese scored at 60 were worth one to two cents more per pound than those cured at a higher temperature. I have summarized in these two statements the main results of our experiments for that year. First, there was a saving of about one per cent. in the shrinkage; second, we got a much improved quality of cheese.

In 1899 we repeated these experiments, and in addition we bought green cheese from two factories in the vicinity of Guelph weighing from 70 to 80 pounds. Cheese made in our own dairy lost 4.4 curing at 60 degrees, cheese from the outside factory lost 2.4, cheese cured at 65 degrees lost 4.5, the larger cheese 2.5. At 70 degrees they lost 4.9, and the large cheese 3 per cent.

In 1900 we repeated these experiments again, because we were not satisfied with getting results once. The man who makes an experiment once and draws conclusions from that experiment will find when he repeats it that he will get altogether different results, and therefore we have aimed to repeat our experiments not only several times during one year but over a series of years, so that we may have the results from different conditions of weather, sunshine and moisture, and so on, and it is only by repeating these experiments for several years that we feel warranted in drawing certain conclusions. In 1900 the results were similar to those of previous years.

Now, to come to our experiment of this past year. The chief object we had in view was to find out, first, whether the cheese would cure at a temperature of 40 degrees in cold storage, second, whether it would be better to put the cheese into an ordinary cooling room one, two or three weeks, and then put them in cold storage. A great many cheese makers say that experiments made with a small quantity of milk are not like factory conditions, and that they are not safe experiments upon which to base conclusions. I want to say right here that there is no man who can take a large vat of milk and carry out a successful experiment, because the milk will get out of his control, and no experiment is worth anything unless the man who is making the experiment controls every other condition, and makes every condition alike except the one point he is investigating, and I would not give you anything for an experiment that does not cover that condition. A large quantity of the milk gets beyond the control of the maker with as a result that the experiment is not worth very much. We put 1,500 pounds of milk in the vat, and five flat cheese weighing about 30 pounds each. We made these experiments in the beginning of April and continued until November. When the cheese were taken from the hoops one of these cheese was put into the ice cold storage at a temperature of about 40 degrees. Our cold storage is built on the system that the ice is put into one end and not moved during the whole summer. The cold air from the ice settles in the bottom and comes into the refrigerator and the warm air goes over the top and comes back, and in that way we have a circulation of air. These experiments have been made from two or four times each month, from April to November. At the end of a week we took out one of the cheese we had put into the ordinary curing room and put it into the cold storage. At the end of two weeks we took another out, and at the end of three weeks we took out another. The fifth cheese remained at an average temperature of about 65 degrees.

What were the results ? The loss in weight in curing in which cheese put from the hoops into the cold storage was 2.1 for the whole season. Cheese remaining for one week in the ordinary curing room and then put in the cold storage lost 2.8, and cheese remaining two weeks in the ordinary curing room and then put in cold storage lost 3.2, the cheese remaining three weeks in the ordinary curing room and then put into cold storage lost 3.6. All these weights were taken when cheese were one month old.

The cheese cured at the average temperature lost 4.4 per cent. Now you see we have a difference from 2.1 to 4.4 per cent. between the cheese cured in cold storage as compared with cheese cured in the ordinary curing room. So we see the loss in weight, or shrinkage, was less when we put the cheese into the cold storage after they came from the hoops. The less time that elapses, the less shrinkage. As regards the curing of cheese Prof. Harcourt has not yet finished his work.

Professor Harrison made a bacteriological examination, and so far our results are complete only up to August. We have made no examination whatever of September, October and November cheese. I am talking now from results of experiments made up to August. As nearly as we can judge, cheese put from the hoop directly into cold storage would cure in from three to four months to about the same condition as a similar cheese would cure in an ordinary curing room in about four to six weeks. We were not satisfied with our own judgment of these cheese, so on September 21st we had Mr. Adam Bell, Mr. Steinhoff and Mr. J. W. Muir come to our dairy and score these cheese. They did not know how these cheese were made, in fact, they knew nothing about the experiment. After averaging their scores of all the cheese which had been made up to about the middle of July we find they stood in the following order : Cheese cured in cold storage 91 1-2, in cold storage in one week 90.8, after two weeks 92.1, after three weeks 90.5. You will notice that the cheese made July 6th and put into cold storage at the end of two weeks stood the highest. These same cheese were sent to Montreal and scored by six expert gentlemen, and the cheese made on November 11th scored 92.1 and the cheese cured in cold storage 89.8, put in cold storage at the end of a week 84.8, put into cold storage at the end of two weeks 80. The cheese which had been cured in the ordinary temperature had gone off flavor, so we did not think it advisable to send it to Montreal. The buyers were surprised at the condition of the cheese, they did not believe cheese put from the hoops directly into cold storage would cure, but thought that they would be curded in condition, and probably have a bitter flavor. I myself was surprised at the results. And if the results in the September, October and November cheese correspond with those obtained earlier in the season, I think we may safely say that we need to change our methods in curing cheese. Mind you, this work has but fairly commenced, other experimenters are working. Dr. Babcock and Dr. Russell are working on this problem. Up to the present time all we are prepared to recommend is that the cheese made in the month of July and August, if put into cold storage as soon as possible after they are made, will be better, and we will not hear so much complaint about bad flavor and bad qualities in cheese. And I will go farther than that, and say that I consider it a suicidal policy for these cheese makers to make cheese in July and August and hold them in the ordinary curing rooms of the country, and waste the fat in the cheese, and destroy the flavors, and destroy the body and texture of the cheese. And that our people must realize that if we are going to hold the position which we have in the markets of Great Britain to-day we must change our methods in this respect. It is a waste of good food material to hold these cheese so long in the curing rooms of this country. I do not think that cheese at any time should go above 60 or 65, everything that has been said about improved curing rooms and about sub-earth ducts, is just as applicable to-day as it was last year, only we are going just one step further and advising you to get them into cold storage as soon as possible. That is as far as our work has gone at the present time, and I think we are on safe grounds.

You ask me how are you going to get cold storage ? There are cold storage plants all over the country. For a large portion of the year these cold storage plants are more or less idle, and there is room for our cheese to be put into cold storage, but in case there is no room in these cold storages what are we going to do ? The large factories should have a cold storage plant of their own, either ice or mechanical refrigeration. There is a point right there. Talking with a man who has made some experiments in Boston, he says cheese put into cold storage under mechanical refrigeration do not turn out satisfactorily, that they are too dry and crumbly, because the air in the cold storage was so dry that it caused too great evaporation from the

cheese. I do not know about that. I am free to say that there are more things in connection with this that I do not know than there are that I do know.

Our work was done on ice cold storage, where the moisture was 75 or 80 per cent., so if we adopt cold storage we must at the same time have a certain amount of moisture in the air. Large factories should have cold storage where they can put their cheese in hot weather, and where they can put them when the market is not satisfactory. I think the man who owns the cheese often feels that if he could be sure the cheese would keep good he would hold them. I think the salesman should have a place where he could put his cheese where they will not deteriorate in quality. And in the case of the small factories I think we ought to have cold storage at central points. This applies more particularly to eastern Ontario, where there are so many small factories ; and in these places where there are so many small factories we must either centralize these small plants or we must provide cold storage where these men can put their cheese, and where the buyer can see a large number without driving all over the country and wasting a great deal of time and spending money inspecting cheese at these small factories. Now the Ontario Government in their wisdom have granted one-fifth of the cost of cold storage to any person who will ask them, the sum not to exceed $500, and I have no doubt that sum can be increased. The Government has provided that co-operative factories or companies of any kind who wish to build cold storage, can build these and have one-fifth of the cost contributed by the Government, the total amount not to exceed $500. I am satisfied that the men who are at the head of affairs in this country are so impressed with the importance of cold storage for our dairy products that they are prepared to assist the farmers and the dairymen of this country to the greatest possible extent. We have on the platform two members of Parliament. One a member of the Provincial Parliament and the other of the Dominion, and these gentlemen will tell you how the Government is prepared to help the farmers and the dairymen of this country if they will only help themselves. But we are very often not willing to help ourselves. We expect the Government to do everything for us. I have brought before you very briefly some points which I consider of the greatest importance in this question of curing cheese in cold storage, and I leave you to think them over.

The Chairman : I have listened, and I am sure you have all listened, with a great deal of interest to Prof. Dean's paper. I happened to see those cheese he sent to Montreal, and I can tell you it is a very great surprise to me to find the cheese in such good condition, and it was a surprise to me they were of such good color. The cheese that were put into cold storage immediately from the hoop were better than those that were put in after two or three weeks. The texture was as desirable as could be. They seemed to have a little more moisture than were ordinarily desired, but they were not excessively moist, while those that were put in at two and three weeks seemed to be too dry. They had much the character of the store cheese when they came out of storage in the winter time—they seemed too dry. These cheese that were put in immediately from the hoop, or one week from the hoop, had the texture of perfect fall cheese, and had none of the flavor we feared they would have. So far as the experiments have gone, they seem to prove that the proper way to handle cheese is to put them immediately from the hoop into cold storage.

Mr. Connolly : How long would you have to cure them in cold storage before you considered them cured.

Prof. Dean : At the end of three or four months. The cheese put directly into cold storage had about the same characteristics as cheese held in the ordinary curing room for four to six weeks. From chemical analysis the amount of soluble nitrogen was about as follows : Cheese put into cold storage directly had the same amount of soluble nitrogen in three months as cheese put into ordinary curing rooms would have in one month. Our results are not yet completed, but, practically speaking, I would say in from three to four months at 40 degrees, that cheese would be in about the same condition as if held in an ordinary curing room for from four to six weeks.

A Member : We would have to wait for our money all that time.

Prof. Dean : That is a practical question. There are buyers here to-day who tell me they have had returns from England this past year that the cheese were bad in flavor, and that the importers are complaining bitterly about them, and it becomes a question as to whether we cannot better afford to wait a little longer than have the reputation of our cheese spoilt. I believe it is possible to get the banks to advance money on the cheese which are stored in cold storage. I do not believe there is any difficulty in advancing money. If we can improve the quality of our cheese I believe the banks and the moneyed men of the country are willing to help us if we will try to help ourselves.

Mr. Millar : Were these cheese boxed when put in cold storage?

Prof. Dean : In the case of most of our experiments they were put on the shelf in cold storage. We made an experiment in which we put one cheese directly into a box from the hoops, the other cheese we put into the curing room for a week, and then put them into cold storage. I examined both these cheese and they were both equally good, but were both badly moulded, and also two other cheese made at the same time. As far as we could judge from that experiment, a cheese put directly into a well-seasoned box was just as good as those put on the shelf, except that they were badly moulded.

The Chairman : Did you examine the rinds, that is the lower end?

Prof. Dean : They were not turned at all, just simply put in the box.

A Member : Have you any of these cheese here?

Prof. Dean : No. we have not.

A Member : Why did you not bring some?

Prof. Dean : We have a September, October and November cheese. I think we have some of the July and August cheese still in our cold storage at Guelph, and we would be very glad to have any one come there and see these cheese. Mr. Steinhoff. Mr. Muir and Mr. Bell were there and saw them, and we would be glad to have any of you see them.

A Member : How much rennet were you using?

Prof. Dean : Three and a third of rennet to one thousand pounds of milk. By using more rennet and setting to a lower temperature and cooking to a lower temperature, such cheese in the ordinary curing room developed too much acid. One cheese put into cold storage and compared with the cheese made in the ordinary way, were equal in quality, and we have an increase of over a pound of cheese for a thousand pounds of milk in the cheese put in cold storage. I am satisfied we know practically nothing of these problems.

You should bear in mind that over one-half of the solids in the milk are run out into the whey tank and wasted, and I ask you if there is a greater waste of good food. I think it is possible to retain a large portion of these solids of the milk in the form of cheese or some other form if we knew how to handle it.

Mr. MacLaren : Would it be possible to have any of these cheese brought here so that the cheese makers could see them?

Prof. Dean : Yes. I intend to return to Guelph this evening, and I can ship some up to-morrow if it is considered advisable.

BITTER MILK AND CHEESE.

By Prof. F. C. Harrison, O.A.C., Guelph.

Since the middle of August almost up to the end of the year we were engaged in investigating what has been termed "bitter milk" and also "bitter cheese," and I will give you a short account of how these bitter flavors occurred. and what steps have been taken in order to study the matter.

In August we were asked to investigate the cause of bitter cheese by a factory in this vicinity. We had samples of curd and also samples of cheese sent us, and from these samples we isolated the organism which, when inoculated into the sterilized milk, produced an intensely bitter, astringent taste. We next made small experiments, just using, instead of your ordinary lactic acid starter, a starter made from these organisms in sterilized milk. This was added to ordinary milk as received at the dairy, and a small cheese was male, and we produced in that cheese a somewhat similar flavor to that which was troubling the factory.

Exactly the same steps have to be worked out in connection with all diseases of the human body or of an animal or whether they relate to the cheese-making industry. These steps are as follows :

First of all, the organism, the bacterium, if it is one, has to be isolated from the diseased man or animal, it is then grown in pure culture and inoculated into a healthy animal, and if it produces the same symptoms as we noticed in the diseased animal and if we subsequently isolate exactly the same germ from the inoculated animal then we can say we have proved the tendency of the germ in the production of the disease, and we have to do the same thing in tracing a germ that may occur in cheese. So the first step we had to take was to isolate this germ, and to produce the same flavor in cheese, and to recover that germ from our experimental cheese. After isolating this organism, which I may state is not a bacterium but a form of yeast I will proceed to study its characteristics and also as to what it produces. Then having achieved these preliminary steps, the next thing was to find out just where it came from, and to do that we had to investigate the bacterial contents, that is the number of bacteria, the character of them, and the kind of them in the first milkings from a number of cows, to see whether this organism came directly from the cows or from some other source. In addition we had to look to the can washings, and to do this we took sterilized bottles containing sterilized water, poured a little of this water into a can, and swished it around a little, then poured it back and replaced the glass stoppers, and then took it back to the laboratory for examination.

There were a very large number of analyses, which took considerable time, and I will give you as briefly as possible the results of these examinations. First of all with regard to the mixed milk from all the patrons. In that milk we found a very large bacerial content, of not only a large number of bacteria, but also very many different kinds. Thus, for instance, the bitter yeast was practically present in all of them. There were but two or three samples in which we did not find this bitter organism present in the milk of all the different patrons. In addition we find a large number of gas-producing bacteria. Some samples contained far more than others. Then, also, there was in this milk a mould which produced a red color. On visiting the factory you would be immediately struck with the color of the cheese cloths. We find in the milk a large number of spores of red mould. which produce a red pigment or paint, and that was the reason of the color in these cheese covers.

With regard to the next point, the bacteria contents of the first milkings of the cows. About some twenty herds were examined, and in no case did we find anything in these first milkings except the lactic acid bacillus and one or two perfectly harmless kind. Now lactic acid bacillus is frequently found in the first milkings of the cows, and of course its presence there is a contamination, but it does not do any harm. We did not succeed in finding the bitter organism in the first milking of the cows' examination. Then, turning to the stables. All stables in which the milking was done of these 82 patrons were examined in the following manner : We took little glass dishes, previously sterilized, and wrapped in sterilized paper. Upon the lower portion of the dish we put some sterilized gum, in order that anything falling upon it might adhere to it. These were prepared in the laboratory, and were not opened till they were exposed in the stable which we wished to examine. Then these little dishes, which consist of a lower dish and of colored glass, were exposed in the stable, and the bacteria which might be floating around there would be de-

posited on the top of this gum and then we replaced the cover and wrapped them up again in sterilized paper and took them back to the laboratory, where proper food would be supplied them, and we would be able to find what kind of organisms were present in the stable. This was done in all the stables, and in no case did we find this bitter organism—in no single instance was it present in the stable air. Of course, these plates were only exposed for a short time, and compared with the large body of air in the stable, they would be very trifling indeed, as they only have a diameter of three and a half inches. In some thirty of these stables we found this red mould present, which caused the color of the cloths in the factory, and I do not doubt but that it was present in all these stables if we had made a thoroughly exhaustive examination.

Another factor that was brought out in these stable examinations was the extremely large number of gas-producing bacteria present. Not only bacteria that comes from manure, but those from fodders. They are injurious on account of the production of gas, but they also gave a nasty, dirty flavor to the cheese, and I believe they are very frequently the cause of the trouble which was prevalent some years ago, mottling, and the flavor of the cheese is extremely bad. So you see you have two or three very undesirable factors which come in from the stable air. We have moulds present which are undesirable, and this large class of gas-producing bacteria, and we have a class of putrefactive forms which are able to give an extremely bad flavor to the cheese.

Then the last examination was the can washings. At some farms there was probably but one can, others two, and sometimes three. And we also examined the washings of some of the pails. The results of these examinations were as follows:

That in some 82 sets of cans examined, 81 contained this bitter organism. In the one exception the man did not draw back to his farm the whey in the can in which he brought the milk to the factory. (Applause.) That, of course, points to a great infection from returning the whey to the farm in the same cans in which the milk was brought, but that does not get down to the bottom of the matter after all, because where did initial infections come from? That was the next point we endeavored to get at. It is a well-known fact that on certain kinds of fruit and on certain kinds of leaves there are yeasts present, and I could cite to you a number of instances in which yeasts are present on certain kinds of fruit from which alcoholic drinks are made. Thus, for example, in India they have a flower called the Mower flower, on which there is a species of yeast, from which the natives make an alcoholic drink, and on account of this organism being a yeast I thought that probably we might find it on fruit, or on some of the leaves of trees, and such proves to be the case. We isolated this organism from the leaves of certain species of maples growing on the farms of a number of these patrons. And that shows you where the original infection came from. The milk stands and the milk cans were kept under such trees, the wind or air would dislodge these organisms from the leaves into the milk can, and of course when the milk was subsequently poured into the milk can, it would act as a perfect food for them, and they would increase there. How far these causes of infection from trees are operating day in and day out I am unable to say: but in connection with these washings of cans, I do not think every can would be infected from the trees, because on many of the farms there were none of these trees present; and on some farms there was a total absence of trees in that neighborhood, yet the uniformity with which this yeast was present in the can washings pointed to the infection from the whey, and the following series of experiments will show you how that is.

We took a can similar to the cans in use among the patrons and infected it with the culture of this bitter organism. It was a can in fairly good condition. We infected it for some twelve hours with this bitter organism, and then the can went through the ordinary washing—that is, it was scraped out with ordinary warm water that you could comfortably put your hands in, and then that was poured off and a kettle full of warm water was poured around the can. We used several quantities of water in that can from two, three, four, five, six and seven quarts. We tried to duplicate the conditons of can

washings as they exist on these farms. A kettle of boiling water is taken from the house to where the can is kept, ten or fifteen yards, so that the water actually arrives at the can with the temperature lower, somewhere from 212 degrees to 190 degrees or 200 degrees. The water with which these experiments were made was at 195 degrees, and we found that where we used two to seven quarts of water, the organism was not killed. We succeeded in pouring off the water and pouring in a little sterilized milk or some other food which these organisms live upon, and in all cases we could recover from that new material the bitter organism, showing that it was not killed by the ordinary method of can washing.

Then these experiments have taken also another turn, in that we have made starters of them and made experiment cheese. These experiment cheese are not exactly similar in flavor to those from this factory, for the very simple reason that the conditions are not absolutely alike. You cannot exactly duplicate the conditions. For instance, there might be some millions of one kind of germ there and some millions of a third kind, and we could not get the same ratio in our experiments. At the time of this trouble a couple of lectures were given to the patrons, and samples were taken, and they were satisfied as to the bitterness of the taste of the sterilized milk that this organism has grown in.

I suppose I should say something about how to remedy this state of affairs, and of course the one that will at once suggest itself to you would be stop sending the whey back to the farm in the same can that the milk is brought in. Unfortunately the patrons do not care to do that. They have probably an exaggerated notion of the food value of the whey for pigs, and on that account they are very loth to give up this whey. But there is one method whereby it can be controlled, and that is by the use of a proper cooling apparatus on each farm, because we have found that by reducing the temperature, the multiplication of this organism is considerably curtailed. It does not increase very rapidly when the milk is cooled down to 65 degrees, but at a temperature of 77 degrees it increases with enormous rapidity. And also in the course of manufacture, directly the cheese gets up to 80 or 90 degrees there is a tremendous increase going on, and the acid which is developed side by side with it does not hurt it, in fact the acid seems to stimulate it, because in a number of experiments we have taken we have seen there is a better growth of this organism when there is 1 per cent. of this acid present than when there is no acid present at all. So you see it is one of these things you cannot control by means of the acid starter. This investigation is not entirely complete. The biology of the organism has not been altogether worked out yet. This is rather information for fellow biologists than for fellow men. At the same time it is of great importance because it helps us in the study of the organism and its environment.

The Chairman: That only goes to prove what we have already contended, that we want more education among the farmers. We have reached that stage in the manufacture of cheese that we want better milk more than better cheese-makers.

A Member: Will Prof. Harrison tell us why we have the bitter flavor one year, and not for some time after. I think there is a great deal in the way the wind blows. Years ago a farmer would keep two or three hogs around, but now every farmer has a hog pen, and if the wind blows from the direction of that hog pen you get a bad odor. I think the hog pen has a good deal to do with the flavor, and that the patrons of the factories should be more careful in keeping away the smell of the hog pen. I think the bitter flavor comes from the hog pen, and that a good many of the patrons could help considerably by keeping their milk in the opposite direction from the wind when it is blowing from the hog pen, and I do not think there is enough straining of the milk done at the farm.

Prof. Harrison: I think the gentleman here is mixing up two things. Bitter flavor can be produced, and sometimes is produced, by other causes than the bitter organism which I have described to you, but a smell is one thing, and an organism is another. Milk will absorb certain flavors. If you leave it in a stable it will absorb the cow or stable odor, if you leave it in the piggery it will have the odor of the piggery. That is simply an absorption of odor, and is quite different from the bitter flavor which

is brought about by the growth or multiplication of bitter organisms. Bitterness may also be brought about by the cows eating certain kinds of weed, as rag weed, and in advanced lactation sometimes the milk of the cow will become slightly bitter, but it is not so pronounced, and if mixed with milk of a larger number of cows in full lactation it will not be noticed. Bitterness may also come from a certain disease of the udder, but these are quite different from the bitterness which comes from a microbic organism, and which causes the production of this bitter substance in the milk, and you can tell the difference between this organism, which is connected with life, and one which is not. Flavor from the absorption of odors is most undesirable when the milk is fresh, and after a time it passes away, and that is the one way in which you can tell an organism or any trouble caused by absorption. You can make experiments yourself, you can take portions of the milk and pasteurize it, and add a little of the milk which you think has a bad flavor, and see if you can produce it in the sterilized milk. If you can you can lay the blame to an organism.

Mr. McFarlane : Which is the best to get good milk from, sulphur water, rain water, or hard water ?

Prof. Harrison : Pure water. What do you mean by sulphur water? If your cows are complaining of rheumatism I would advise sulphur water, but for ordinary use rain water, provided it is pure, would be better.

A Member : Does frozen milk give a bitter flavor ?

Prof. Harrison : I do not think so.

A Member : Would it be injurious to butter or cheese ?

Prof. Harrison : I cannot say that, but I know that in Denmark they use frozen milk very largely. They freeze the milk in Denmark and send it to Paris and Warsaw and Southampton, three hundred miles away, and the milk is bought there and used for consumption, and of course a bitter flavor would be very undesirable and would be much noticed, so I feel safe in saying freezing will not cause bitterness. Of course the great difficulty in frozen milk is that you cannot subsequently separate the fat from the other portion of the milk. It is very hard to get a separation after, and I think that is where the principal difficulty would lie for cheese-making.

CONDITIONS AFFECTING THE CURING OF CHEESE.

Dr. Van Slyke, of the State Experiment Station, Geneva, N.Y., read a paper upon the above-named subject. It will be found in the report of the proceedings of the Eastern Dairymen's Association, Page 42.

WELCOMED BY THE MAYOR.

The evening session was largely attended. An orchestra rendered excellent music, and several songs were sung by the city's best vocalists.

Dr. John Mearns, Mayor of Woodstock, welcomed the members of the Association in a bright speech, which was loudly applauded. Among other things, he pointed out that during the seven years elapsing since the convention had last been held in Woodstock, the place had undergone a change. "We have merged," said he, "from the area of a town to a city, and you, as an Association, have gone on building up your industry and expanding it, and you have succeeded in taking possession of the world's markets. You have gone over to Buffalo, to your cousins in the south, and outshone them there, having, as I understand, come out ahead of them in the matter of cheese and butter. We in Woodstock, situated as we are in the centre of the greatest dairy industry in the Province, in fact of the Dominion of Canada, know quite well, and realize fully, how much we owe to you, how much we owe to your industry, and how much we owe to the conventions you are holding every year. Your prosperity is our prosperity, your education benefits us, and the more money you succeed in putting into your pockets in consequence

of this business of yours, the better it is for us and the more we are benefited. But it not only benefits us, but benefits our Province and country at large."

The Chairman: I know I voice the sentiments of our Association when I say we thank you most heartily for your welcome. I know also that the members of this Association are delighted to come to Woodstock. On this occasion, the first since Woodstock has become a city, they have enjoyed it even more than on any former occasion. It is in the midst of probably the most important dairy section in the Dominion of Canada. I do not know that there is any place where we work up more enthusiasm than we do in Woodstock, and I do not think there is any place where we have a better or more enthusiastic meeting than we have here. We thank you for the accommodation you have extended to us, and for the entertainment that will be provided to-night.

ADDRESS.

By D. Derbyshire, President Eastern Dairymen's Association, Brockville.

About twelve years ago I delivered an address at Appin to our dairymen there to encourage them in the work, and I expressed then the sentiment that this was the original home of the modern dairy, and do you know the Woodstock Sentinel-Review came out furious next week against the idea of such a thing as that, and mentioned men who had started the dairy business earlier here near the Town of Woodstock. But you know we love Mr. Pattullo in the east, and it was a great pleasure for our board to invite him to our convention, and I assure you we feel very thankful to him for attending our convention last week and making the magnificent address he delivered to our Association. It was a great experience to us, and I believe that Mr. Pattullo has done more on the floor of the Local House than any other member in connection with the dairy business. (Applause.) We feel proud of him. It is a great thing to have a man you can whisper to in the Legislature in connection with things that we think quite important, that possibly other members, just as good in their way, but who are not in that hearty sympathy with the work, may not think is necessary.

We have a great many things to do. We have been improving. Of course they talk in the papers that we are not doing anything, and that the cheese business is going back. Still when you come to figure up that we sent $25,500,000 worth of butter and cheese last year, 1901, you will acknowledge that we are doing something, and let any man attend one of our well equipped dairy schools and become educated, and go out among the factories, and he will see that we have made finer cheese in 1901 than ever was made in the history of this Dominion. (Applause.)

I feel proud of that fact, and while we have yet some poorly equipped factories, with ordinary makers, who have been hired on account of their cheapness, yet we make good cheese in the majority of our factories. We have the lesson before us, and the trouble will heap upon our heads if we allow this thing to continue. One of the very discouraging things in connection with the dairy business is that you will see advertisements in some little country paper asking for tenders to manufacture butter and cheese in such a factory. Do you know that thing stirs my blood every time? I think of it every time I see one of these things. In place of looking for a man on account of his ability to make the finest cheese, and paying him the price sufficient to bring his services there, so as to build up the industry in that locality,—in place of doing that they are looking after the cheapest man who will make the cheapest and poorest goods, and where we have them doing that they are sure to make a failure. It rests with the people whether these things will be remedied, and this convention and this Association particularly, and the Eastern Association as well, are looking to the people to wipe these things out, to discard every old factory and put a better one in its place, or uniting two small ordinary factories and having one first-class factory in that locality, with well qualified men to take hold of the work and make a finer quality of cheese than was ever made before. We want the farmers to take hold of the work earnestly with us, and assist us in

this great work by producing a finer quality of milk, keeping everything absolutely clean about their own person, their stables, their milk cans and milk waggons, and everything in connection with this milk until it goes to the factory, and then see to it that they have a proper factory, with a well equipped curing room and well qualified men in charge, who will take a step this 1902 just out of the way of our competitors in connection with this great business.

Now the point is, will the people go home and take this matter to heart, and do these things that we so much desire ? Our Government are perfectly willing to assist. The Hon. Sydney Fisher, Minister of Agriculture, at the suggestion of this Association, as well as the Eastern Association, introduced in the ships the cold-air system, so that the cold air is thrown into quite a few ships, so as to control the temperature of the cheese while in transit, so they would be perfectly cool in the ships, and delivered in the old country in perfect condition. We are delighted that the Minister took this matter up, and we are pleased to know that he has promised to give us an improved service this year with a larger number of ships, so that we can put a larger quantity of our cheese in good condition on the British market. And now you want to go right back home and make the goods right, get them to market right. All our butter is shipped in refrigerator cars, and we want every box of cheese in this country to be taken to the market in the same way, and then we will be in a position to compete with the world, and will take a step in advance ; and we call upon this Association to do the very best thing possible to reach all the makers and all the people to qualify themselves, and to put themselves a step in advance of anything they have done. It is for us as Canadians to take a position in advance of what we have ever done before, and I believe we can make $50,000,000 a year in connection with our butter, cheese and bacon this next year. It requires an effort on the part of every dairyman in this Dominion in getting the milk to the factory in better condition and to improve the waggons. If there is any poverty-stricken looking thing in our country it is the milk waggon, and the milk drawer himself. They have sometimes an old, distressed-looking horse and a worse harness. Why not put on a better and a cleaner rig ; clean everything up, and you will see how quick they will look after our goods in preference to anything else in the world. I am satisfied from letters I have seen that there is the very best feeling in the British market in connection with anything that is Canadian. We have done well for them, we have looked after their interests, and they are interesting themselves with us as they never have in the past.

It is always a great inspiration for me to come west and see what you are doing. A man wants to have a good opinion of himself in order to do the best kind of work, and I can tell you the finest cheese that will be made in this country will be made near Brockville in 1902. (Laughter.) Our people are thoroughly alive to this thing, and at Whitby the other day they expressed their determination every one that they would go home, and that they would improve their factories and do everything in their power to make the best cheese in the world. And we do hope you will do as well as we do, and, if you do, this Dominion will flourish and prosper, and we will all go to glory together, and the dairymen will be the first people there. (Laughter and applause.)

The Chairman : A convention of the dairymen of Western Ontario would not be complete without the genial President of the Eastern Association, and I think he gets a great deal of inspiration from us in the west.

Mr. E. W. Nesbitt, President of Woodstock Board of Trade, also welcomed the convention, and, among other things, said : There is no doubt in my mind that dairymen have still plenty to learn. I have pleasure in saying that during last summer I visited several factories that were beautifully clean, everything good enough to eat off the floor. It seems impossible that a liquid like milk, that is so easily tainted, could be made up into any form of product unless it is kept perfectly clean from the time it comes from the cow until it is manufactured, and even after that I should say it would require to be kept clean. It is not only at the factory, but the farmers who send the milk to the factory should take great care to keep the product pure and clean. A great many farmers are too anxious as to the quantity of milk they produce, without

reference to the quality. I see a number of gentlemen on the platform who keep on telling you something that will be useful, and I hope that every man who is working in the dairy interest in this country will make an earnest effort to do better in the future. I welcome you to the city of Woodstock. I hope we may see you here many times, as we are the centre of the dairy industry. Practically speaking, we are just as much interested as the farmers who make the cheese or butter, because it is largely through them that we keep our existence, and we are all interested in what interests our pockets.

Mr. A. F. MacLaren, M.P., Stratford: I am glad, indeed, to receive such a kind welcome by his Worship the Mayor and the President of the Board of Trade. I hope to have a very pleasant visit among the people of Woodstock, and I hope we will go home carrying with us something new, and that when we go home we will put it into force and will not allow the other countries of the world to go ahead of us. Instead of sending our best men away to other countries we should send them to England to educate the people there with regard to our products in this country, and I would like to see the time when we will have a warehouse in London, England, and Liverpool, and Bristol, and Manchester, and have educated men in charge of these warehouses—men who understand this business, and the poultry business, and the butter business, and the pork business, and all the different lines of products which are purchased in Canada. Men who will be able to talk them up and educate the people over there with regard to them. When over there I heard people talking about America, this, and America that. I think the mother country should recognize us more than they do and call us Canadians, and call our products Canadian products.

ADDRESS.

By Andrew Pattullo, M.P.P., Woodstock.

It is no ordinary pleasure, I can assure you, to be with you to-night, and so be able to arrange my duties that I hope to have the pleasure of attending all the sessions of this Dairymen's Convention this week. The kind words of your Chairman and others are scarcely deserved by me. But I think I may say this for myself, that while the pressure of other matters during the last few years has prevented me from taking so direct a part in connection with the work of the Dairymen's Association of Western Ontario, I have never lost my interest either in the men engaged in the work, or in the great industry with which you are connected. While I have been sitting on the platform at this convention I have been in a reminiscent mood. Shadows of the past would come up, voices of the past I thought I could hear to-night. I was thinking, while the gentlemen were entertaining you, of another gathering of this sort, the last convention of this Association, in this same building, a meeting of dairymen, of dairy farmers, and others, and it was regarded as the greatest agricultural gathering of the kind ever held in the Dominion of Canada, and if there is a single regret which I have to-night, it is that along with a number of prominent men who are still here, like my friend Mr. Derbyshire and others, who took part on that occasion, some of the men who were then with us are now absent; and how you wish and how I wish we could have good old Theodore Louis here, and John Gould. These were great men, whom we welcomed on that occasion with open arms, and who gave us such a treat as we soon will not forget. And then we had some of our fellow-countrymen on the platform with us upon that occasion, like the Hon. Thomas Ballantyne and Sir Oliver Mowat. It was a great gathering, but I believe we will be able to equal it to-morrow. While I join with the Mayor of the city and the President of the Board of Trade in their admirable welcome to you, who expressed in apt words the feeling of every citizen of Woodstock, yet I feel almost like apologizing, or shall I say finding fault, with some of our citizens who have not turned out to listen to your deliberations. We have not educated the ladies and gentlemen of the cities

and towns of this country to attend gatherings of this sort. However, with this slight defect, this is a very enjoyable meeting, and I congratulate you heartily on this opening session. I might say with regard to my friend Mr. Derbyshire that, after listening to him, you would be surprised that he has been for twenty continuous years President of the Eastern Dairymen's Association, while we have had about a score of presidents in these years. I mention his name for this reason, he does things so well that he seems to carry everything before him. At that meeting at Whitby the other night which I attended, it was a great delight for me to be there, and do you know we had an audience the majority of whom were comprised of ladies and gentlemen of the town of Whitby. My friend Derbyshire will persist in making people believe the Canadian dairy originated down near Brockville. I was a boy when the first cheese factory was built, and that is a good while ago. Though you can all see I am still very young I can remember that quite well. There is therefore no doubt about the fact that the County of Oxford is the original home of the modern dairy, and is still the greatest dairy county, not only in the Dominion of Canada, but on the whole continent of America. (Applause.)

I said I was reminiscent to-night. I was thinking of that last convention held here, and I was thinking of another, and if I am not giving away my age too much I will tell you that I have been officially connected with this dairy industry for no less than twenty-five years. That seems a pretty long time, but my friend Mr. James S. Scott, whom I am glad to see out to-night, put in my hand an old paper of 1877 in which there is a report of the meeting held in the town of Woodstock for the purpose of establishing the first cheese market. That is a long time ago. I happened to be one of those who were there, and out of that small beginning arose the present cheese board, which used to be the place where they sold cheese. Of course the cheese market is a place where they do not sell cheese—(laughter)—but that is not the fault of the people who made that small beginning. On that occasion they had a banquet, and it is pleasant for me to go back and read the report, and here are some of the names of those who attended on that occasion :

E. Caswell. He was a worthy man and prominent in the dairying industry. David Morton, John Craig, Major Robert Nevell, F. Malcolm—one of the most intelligent dairymen that this country ever saw, a man who did a great deal for the industry here and elsewhere, and who left his mark in the literature of the first agricultural committee which ever sat in the Province of Ontario. The late Captain Chambers, Joseph Pearce, Thomas Oliver, M.P., Joseph Plaskett, Henry Parker, John Douglas, Hamilton Burtch. These were among the men who were at that first meeting, and all of whom I think I may say are now among our great departed. Out of that meeting a great deal came. The secretary at that time was Mr. James S. Scarff. I may mention one fact in conection with the dinner which was held on that occasion. At the dinner I noticed two gentlemen responded to the toast of the ladies, the Hon. James Sutherland and Mr. Thomas Lockhart. Twenty-five years ago they responded to the toast of the ladies, and they have been failing to respond to the ladies ever since—they are still old bachelors. And I noticed a few years afterwards that I was designated along with the Board of Trade, Mr. T. H. Parker, Mr. Scarff and Henry Parker and Robert Wedlow, to attend on behalf of the Board of Trade the Dairymen's Association of Western Ontario. Now, gentlemen, I am sure you will forgive me this little personal reminiscence, going back as it does to the beginning of the active work in the then town of Woodstock in relation to dairying. The town of Ingersoll, to its credit, was a little ahead of us. But what I desire to point out is this, that from a small beginning like that in the way of organization great things have come, and it is just in the same way in connection with this dairy association—out of a small beginning, a few men getting together thirty-five years ago and starting this Association, great things have come, not only to this district, but to the whole of Canada, and to the whole Province and indeed to the whole Dominion of Canada.

We have had already some technical talk of the very highest importance and value. You have had food for thought this afternoon and this evening from a man who is one of the leading experimentalists of the day, a chemist of the great institution in the State of New York, and while he was speaking to-day I was thinking of the extraordinary change that has taken place in public opinion among the farmers since I was younger than I am now. Not many years ago farmers used to sneer at what was called scientific agriculture. Professors then were not so popular as they are now. It was supposed it was not necessary to have educated men in relation to agriculture, that anybody might farm if he had a little common sense and a stiff back. But it has passed now. The men sought after and the men desired, and the most popular speakers are those who are students of agriculture, those men from the Agricultural College, those experimentalists, like Dr. VanSlyke, who comes before you and tells you he could not make a cheese which you could eat with safety, but at the same time tells you a great deal about cheese that it is necessary for you to know. He gives you facts upon which the production of good cheese depends. What a change that is. Speaking as I am to an audience partly civic and partly rural, I think that I, perhaps like some of the other speakers to-night, am going a little outside of what you may call shop talk with this convention, because you know I am not an expert cheese maker. I am not an authority upon any of the technical phases of dairying, but at the same time I will say that I am inclined to think that some of this general talk in conventions does some good, perhaps as much good as talk of the other kind. Variety is the spice of life. There are all sorts of men here and all sorts of men in the world. Some men want to hear one thing and some men want to hear another, and I suppose that is why they ask some of us who are not such authorities as others upon these subjects of dairying to take part at this meeting.

I want to speak to you for just a little time on the work of this Association. Now what do you represent here in this town of Woodstock to-day and this week? You represent a very great deal. You represent the greatest industry in this country. It is very easily said, it is said in a few simple words, but contains a world of truth. This is a great country, a country of enormous extent, a country of vast resources. and still I am able to tell you that you here, organized as you are, represent one of the greatest organizations of the Dominion of Canada. Judged by the volume of its output, judged by its exports to foreign markets, judged by its effect upon the character and happiness and prosperity of the people, I have no hesitation in telling you that the greatest industry of Canada to-day is the dairy business, with which you gentlemen are connected. What has your organization done for the dairy business? It has simply been an educational institution. You know what Harvey Farrington and other men of the early days had to do. You know what Mr. Caswell and Mr. Lacey had to do, and what the men of eastern Ontario had to do. They had to create the industry, and all this dairy business of the present day is literally the creation of their brains and their industry. They were working in the dark in those years. They made some sad mistakes. You remember some of them that Prof. Arnold made which cost us dear. But it is through their mistakes that we achieved success. Perhaps we never would succeed if we did not individually and nationally make mistakes and some sad blunders. They went on working and experimenting, and they won success for themselves and for this district and for this whole country. Now, sir, how has this success been achieved by them and by their successors? It was done in only two ways. First of all by experience. That is about the only advantage we used to have in the early days. We have other advantages in these days. We have experience meetings, as our good Methodist friends would say—we have experience meetings, where we tell one another from the platform or from the audience, what we have been doing, and what the results have been, and we also have experimentalists along scientific lines who are experimenting for us and finding out the best method for doing things. And I think they generaly reach the absolute truth and get down to the bottom of

things. The whole object of this convention is to bring together results and compare them. These conventions, like the Farmers' Institutes, are simply part of the educational system of this country, and I want to say just a few words on that subject of education.

Some people imagine, who have not read the newspaper, and are not watching what the farmers of this country have been doing, and what the Department of Agriculture has been doing, that the public schools and the high schools and the universities of this Province constitute our system of education. Do you know, Mr. President, that with all deference to the Minister of Education, and with all deference to the men who have created our splendid system of schools, having in mind and not forgetting the fact that we took the highest honors at the World's Fair for educational systems, I believe that perhaps the greatest branch of the education of this country, judged by its results and judged by the possibilities of the future, is what I shall call that system of education which is today under the Department of Agriculture in this country. I believe, starting with the Agricultural College which has been so ably represented here to-day, an institution which is the most useful one in America to-day barring none, starting from that with the agencies that go out from it, taking in this dairy convention, the farmers' institutes, and the fat stock show and the experimental farms all over the country, I say we are perfecting a system of agricultural education which is equally important and will yield as great results as what is generally called the whole educational system of the country. Speaking some years ago, and somewhat impatiently, to a well-known and worthy gentleman in the town of Woodstock whom I thought was almost classically mad, I thought he paid too much attention to the value of a classical education. He was a great man for the High Schools and the Collegiate Institutes with which he was associated. I said to him one night something which I did not entirely mean. I meant a good deal of it, but I did not mean it all. I said to him, do you know I should like if some night about half of our high schools and half our cheese factories could disappear? He was absolutely horrified, and we went on to discuss what I meant. I said to him I am a profound believer in secondary education, but I think we have gone a little too far in the matter of high schools, because we are producing perhaps more lawyers and doctors in this country than we need. We are taking the boys away from the farm and from the workshop, and I believe that if we gave them another education they would be better fitted for the duties of life. And if the State was to pay for their education they would get a better return if they educated them in another way. Was I right or wrong? (Applause.)

Thank heaven, we have taken a turn, and we are going more in the right direction now. We are introducing into the public schools more agricultural teaching. Getting into the public schools a little more love of rural life and less of the city life, and I think we are making our high schools more practical because we are introducing manual training and technical training, not for the purpose of making artisans, but for the purpose of helping artisans to improve themselves and to enable their sons to become skilled artisans instead of drifting into a profession where there is no possible chance in life for them. We are going in another direction, and some of the ablest men in this country are beginning to see, as I endeavored to make my friend see, the necessity of turning the thoughts of the people of this country into the necessities of the day. I think every dairyman in this country and every farmer in this country, should honor the memory of the late W. E. H. Massey for one thing which he did, and that is his contribution for the purpose of putting up a special building in connection with the Ontario Agricultural College, and also the magnificent gift of Sir William McDonald of Montreal, whose gift towards agricultural education, like his gift towards the teaching of manual traning in the public schools, is one of the noblest benefactions that we Canadians have ever seen. And so we are going on in this system of giving the farmers and the farmers' sons and the youths of this country generally, the best kind of education to fit them for the duties of life in connection with the greatest industry in the country.

We hear a great deal in these days about university extension lectures. You all know what that means. Why, sir, there is an old saying that if the mountain will not go to Mohamet, Mohamet will go to the mountain. University extension lectures means that while you cannot all go to the university, the university professor will come to you and deliver addresses to you, as they have in the town of Woodstock. There is another system of university lectures, lectures which you have exemplified in this convention, which you have exemplified here to-night. You have a scientific gentleman here to-night who is as skilled and up to date as any in our universities, coming to you to talk to you upon the subject of dairying, of milk and butter and cheese. There is an illustration I say of this great system of University Extension lectures in Agriculture. And so I claim for you, gentlemen, who are now running this dairy association, that you are simply carrying on the necesary work of agricultural education in this country. There is no department where there is such a necessity for modern exertion, for modern efforts, for modern invention, and for modern methods, as there is in connection with the farm. You know the struggle for life is between the industries of the country. You know how keen the industrial struggle is between the great nations of the world. We are told now that as Britons we must see some of the interests of the world wrested from us by our competitors. It is dawning upon us more and more every day that if we are going to succeed as a class, if this country is going to hold its own in agriculture in competition with the United States, with New Zealand and Australia and Denmark and other countries, you have got to make better goods than they. You have got to make the best possible goods and put them into the great markets of the world, the great market of Britain, in better conditions than your rivals, and you never can do that without education. Why did I say anything so dreadful as that I would almost rejoice in the disappearance by fire or otherwise of some of the older cheese factories of this country ? Simply for this reason, that some of these old cheese factories have been kept up ten or twenty years longer than they should. When they disappear, of course you get rid of the old bad smells and of a lot of rubbish and of old machinery, and while there may be a little loss and discomfort to somebody, their place would be taken by new factories with new machinery, with new appliances and with new ideas, they would be built according to the latest ideas in architecture, and the result would be an enormous benefit to the community at large.

One of the things that keeps the County of Oxford back in many ways, and which is enabling the southern regions and eastern regions of this country to pass many of the factories of the old County of Oxford, is just because some factories in this country were allowed to stand twenty-five years longer than they should, and these men in the newer regions had built more up-to-date factories.

I have endeavored to communicate to you the objects of these conventions, what they are in the truest and best sense. This Association has lasted longer than Harvey Farrington ever dreamed when he was making his small beginning, and his coadjutator never dreamed that it would have such a far-reaching effect. When Mr. Dunn and Mr. Ballantyne went over to Philadelphia and wrested from the Americans the first laurels which we took from them for cheese, they never dreamed the effect it would have upon us in a national sense. What has been the result in the twenty-five years ? We have just gone on adding at the rate of one million dollars a year to our exports of dairy products, until the exports to-day are just $25,000,000 a year. (Applause.) That is the result of original genius and organization and co-operation, and largely the result of these dairy conventions, this great educational system of which I speak. It is a long distance from Harvey Farrington and Prof. Arnold to Prof. Dean and Mr. Ruddick and Prof. Harrison and Dr. Van Slyke. They worked in the dark and to-day we are working in the light. You start in where they left off, but with twenty-five years of knowledge added to it. You can start with a certainty of success and they couldn't. That does not represent even one-half the benefit which the dairy industry which you represent means to this Can-

ada of ours. The pork industry is practically a by-product of the dairy, it never could have been established apart from the dairy, and it largely depends upon the dairy, and we are actually exporting to-day $12,000,000 worth of pork to the British market. What does all this mean ? Why, gentlemen, it means national wealth and national hope. The very statement of these figures shows the opportunities that are open to the farmers of this country.

Just now we Canadians are congratulating ourselves on the national outlook. It is bright. It never was so bright in the history of the country. We stand to-day very much better in the eyes of the world than we ever stood before. Not very many years ago we were known as one of the colonies, one of the dependencies of the British Empire. We are no longer regarded in that way. I remember being at the Colonial Exhibition in 1886, and going through there I asked for the Canadian department, and I turned with indignation when one of the attendants said. "There is the American department." I turned upon him using language which I am not permitted to use in the Legislature in this country, and which, perhaps, I could not use in the presence of ladies who are here. But I endeavored in good Canadian English to express my indignation and opinion of the fellow in charge of the Colonial Exhibition, who did not know the difference between Canada and the United States. That is pretty nearly all passed. Still, occasionally, we hear the words "American" over there in connection with Canada, although they are beginning to know Canada, and they are beginning to know Canadian goods, and they are beginning to know Canadians in Britain as they are known all over the world, and they know we are no longer a colony but one of those nations which go to make up the greatest empire the world has ever seen. (Applause.) That is the position we occupy to-day in the eyes of the world. In what I shall call a national sense our position has vastly changed in recent years. They are teaching our boys and girls in the schools to-day about the discovery of Canada, but I tell you the great discovery of Canada has been made during recent years, when the Canadian people have discovered themselves—discovered that they can do something, whether on the farm, in the workshop, in the class rooms or in the Legislature—have discovered that the Canadians are man for man equal to the best men in the world to-day. (Applause.) They have discovered Canada in another sense. A few years ago how many people in this country knew what our resources were. How many people in this country who did not have the idea that this was a fringe of scattered Provinces along the skirts of the United States. As an eminent writer used to put it, "a bundle of sticks loosely tied at both ends." We do not hear that sort of description of Canada any more. They used to think that we in the Province of Ontario had a very small Province bordering on the great lakes. Now we know that we in Ontario have a Province in which you can put half a dozen States of the Union. You can put New York, New Hampshire, Massachusetts, Vermont and Connecticut and Rhode Island right into the Province of Ontario. What do you think of it ? It may seem incredible to you, but there it is, and in the boundaries of this Province we have riches we have never dreamed of. We used to know we had in Canada great stretches of timber, but we did not know that in addition to these great stretches of pine, which will last for 100 years, we have an unfailing supply for pulp wood timber, timber for all time to come because it will reproduce itself every twenty-five years, and the Province of Ontario will be a great pulp-producing country. And so it is we have discovered ourselves, and we have discovered our resources. Why do I mention all these things ? Simply because I want to point the moral to you that while the Canadian national outlook is bright to-day, while our reputation is being enhanced in the eye of the world, and while we have this fabulous wealth in forests and mines, and the wheat fields of the Northwest, the greatest in all the world, the greatest gold mine in Canada, the real gold mine of this country, is its agricultural resources. In the gold mines in the Yukon and of British Columbia and the silver mines of this country there is apt to be as much money expended in them as is taken out. Agriculture in recent years in Canada has been unusually prosperous, and I believe it is

likely to remain prosperous. The food which we eat does not come from the mine or the forest, but it comes from the farm.

A gentleman whom I used to see in this town weighed down with cares, returned to Woodstock the other day. He had gone to the Northwest, and is a farmer there, and how much wheat do you think he had this year? Just the little sum of 13,000 bushels. We have the highest hopes for the prosperity of the Rainy River district, and I say even the wheat fields of the Northwest do not hold out such marked hopes as the dairy business to the old man and to the young man of this Canada of ours. I have watched the progress of your industry for thirty years, and I can say of it to-night what cannot be said of any other industry in the country, that it has always prospered. Now what does that mean to the young men? It means that if you are in the dairy business, and if you follow the advice which you hear from the teachers of the industry at this convention, and if you follow the advice of the best men, and follow the best methods in this industry, you are sure to be successful. Let me close with an illustration. I was up in East Nissouri some months ago, and visited the home of an old friend of mine, John Henderson. He took me out to the barn and showed me a sight that many people would not altogether delight in. They would think it rather strange if they were taken out to see what the old man showed me with a considerable amount of pride. What was it? It supplied me with a text. It supplied me with food for thought on my way home. He showed me an old sow and a litter of eleven pigs, and I asked him how much the old one was worth and he amazed me by saying $50, and that the youngsters were worth $3 apiece. I said to myself, "$83 for the old one and her litter of pigs," and I said I wish I was a boy again on the farm and I would go into raising hogs. When I was a boy upon the farm one of the highest aspirations of my life then had been reached when I got a young pig and undertook to fatten it for the market, but it was a bad sort of a pig. It was one of those Canadian hogs, those built entirely for racing. It was the breed that Governor Hoard tells about in that famous story of his when the judge declared at a southern exhibition that no hog was of any use that was not built so that it could out run one of the colored inhabitants of that country. This pig of mine could out run a greyhound. I undertook to feed the animal. It seemed to get but a little sleep, but it never got fat, and when I thought of my experience trying to make money out of that pig, and when I saw this other man with a sow and a litter of eleven that were worth $83, I saw the difference between the time when I was a boy and the happy time when you farmers, young and old, can make every pig sty in the country a literal gold mine.

I came home thinking of these pigs, and thinking that I saw a guarantee for the future of this country. Just so long as you can go on raising cattle and raising hogs at a profit, making cheese and butter at a profit, so long as you can make money out of poultry, I say the future of this country is safe, because the prosperity and happiness of this country rests upon the farm and, more than that, the patriotism of our people rests in our surroundings. If we are prosperous, we are happy. If we are prosperous and happy I think we are more patriotic than if we were miserable. So I say, your prosperity not only leads to your comfort and your happiness, but enhances your love of the country in which you live, and increases the patriotism of the country.

SUUMMER CREAMERIES.

By Aaron Wenger, Ayton.

The subject for which I am billed is Summer Creameries, which means creameries that are operated during the summer. There are two kinds of creameries operated in this country, one designated cream-gathering stations, and the creameries in which the milk is drawn to the station and separated by machinery. The subject upon which I am to speak is cream-gathering stations; that is where the far-

mers separate the cream and send it to the creamery, and it is a subject with which I am most familiar; that is the way in which I conduct my business. Mr. Derbyshire and Mr. Pattullo each claim the honor of having the first cheese factory in their neighborhood, and I claim the honor of having the first butter factory in Ontario on the cream-gathering or any other system. I believe the Ayton factory is the oldest in Ontario; some twenty or twenty-one years ago it started as a whole milk factory, the farmers brought the milk in and the cream was raised by the system of gravitation and the butter made from it; the farmers valued the skim milk very highly, and as a consequence that system did not live very long. Then the deep shot-gun can was introduced, by which the farmers put the milk into the can and put it in cold water, and when the cream had risen took it off, and that was the system adopted in the cream-gathering stations until the separators were introduced, and it is the system that is adopted now where the herds are small. Where the herds are large it may not be the best system, but it fills the gap in mixed farming where they do not keep a great many cows.

I do not intend to follow the subject for any length of time, and I will ask Mr. Smith to take my place, he is familiar with this work and will be able to address you fully on the subject.

SUMMER CREAMERIES.

By Archibald Smith, Superintendent Western Dairy School, Strathroy.

In assisting Mr. Wenger in discussing this subject I may say that it is not my intention to deliver any lengthy address, because I do not think the best interests of the Association are served in that way. I think if we made our addresses shorter and more practical, leaving more time for discussion, that the makers in attendance would derive more benefit. If I am able to offer you a few suggestions in relation to these summer creameries that will serve as a basis for discussion I will be pleased.

About two-thirds of the creameries in western Ontario are operated on the cream-gathering system, and they turn out about four-fifths of the whole amount of butter manufactured. We have creameries in this system that are daily producing from 2,000 to 3,500 pounds of butter, and the system is growing in this country at the present time. All through the northern country we find the smaller cheese factories and some of the larger ones being changed into cream-gathering creameries. In that country the farmers go into stock raising extensively and not so much into the dairying, and we find that the cream-gathering creamery is about the only system that can be satisfactorily operated for any great length of time.

Canadian butter enjoys a very good reputation on the British markets, but there is still a great deal of room for improvement. We are not yet getting the highest price that is paid for the best butter from Denmark. The Danes are getting more for their butter than we are getting, a difference of enough to keep all the farmers' cows in Canada during the summer months, and that is too great a difference for the dairymen of Canada to allow to exist. It need not be and it should not be. There is no reason why we should not produce as good a quality of butter as they do, and if we improve in the next few years to the same extent as we have in the past few years there is no doubt that we will not only equal them, but I see no reason why we should not excel them. The greater portion of our butter finds its way to the markets in Great Britain, and all butter for that market must be of a very uniform quality, it must contain very little salt and be free from excessive moisture, and in order to have butter of that description we must manufacture in large quantities; in other words, it must be manufactured on the creamery system. Take the butter that is at present exported from Russia and Siberia, countries that had never been known to produce butter before, they are now producing it in very large quantities, and it is sometimes equal to the quality of Canadian butter and sells for a price almost equal to that of ours. They are shipping more butter from Australia, New Zealand, Argentine Re-

public and the United States, and in order that we may hold our position on the market against these competitors we must improve our goods.

We find it difficult in the creameries, as well as in the cheese factories, to get the farmers to take as deep an interest in this work as they should and to take proper care of their cream. If one patron's cream is of bad flavor or sour, it will impart that flavor to all the other, and if we have a few careless farmers producing poor cream they injure the rest of the patrons. The success of any creamery or cheese factory will depend upon the financial returns to the patrons, and these returns will be determined almost entirely by the quality of the raw material, provided you have a well-equipped factory and a good maker; so you see the farmers have it in their own hands to improve the quality of the goods and promote our reputation. At the Pan-American Exposition we made a fairly good showing with our butter. There was a very small number of creameries represented as compared with the number we have in operation. Those who did exhibit sent butter of a very good quality. There were only one or two States in the Union that excelled us. I think the improvement in the quality of our goods at the Pan-American is the result of education and the educational facilities provided the butter makers and patrons, and also the large amount of literature on this subject that has been distributed by the Government.

I would just like to say a word here in reference to the improved condition of our creameries. There is vast room for improvement in this respect. I would suggest that you would add to the appearance of your buildings by painting the interior and exterior, which can be done for very little money; and I would suggest that instead of using expensive paints or experimenting with whitewash, that you take a good quality of cement, mix it with skim milk, or buttermilk, to the consistency of ordinary paint, and you can put that on with the sprayer or whitewash brush and I know of no paint that will last for as long or that is quite as economical, you can paint your whole building, inside and out, for less than $2. You can make it whatever color you wish by adding coloring matter to it.

I think the time is near at hand when we will have a greater number of creameries under one man's supervision. By doing so you can get a greater uniformity in the quality of the butter, and you will get a better price, and that will mean a greater revenue to the farmers. You will be able to buy your supplies in larger quantities and for less money. I think one of the principal factors in improving the butter at the cream-gathering creameries is a more universal use of hand separators. I think the manufacturers of hand separators will play a most important part in improving the quality of our butter; first, by the immense amount of literature they are distributing on this subject, and through their agents canvassing the farmers for the purpose of selling machines. In some cases the hand separators, instead of being a benefit, have been an injury in this way; the cream should be cooled immediately after it is skimmed to prevent the development of lactic acid, and to prevent it from souring. Where you mix the warm cream with the cold cream it sours very rapidly, and if we are to get the best results from these hand separators we must cool the cream immediately after it is separated. It is more difficult to reach the farmers in connection with these creameries than it is in connection with the cheese factories, for the reason that they are spread over a larger district. We have small factories where from four to five hundred farmers send their cream and it is a most difficult matter to reach them all. This year meetings were held at a number of factories, which were a great success. They held meetings at different points in the territory so as to reach all the farmers. This year we are preparing a bulletin at the Western Dairy School especially on this subject, and we will have it ready for distribution early in the spring.

The cream-gatherer should be a man of intelligence and capable of discussing with the farmers the requirements of the market, and the best methods of caring for the cream and milk, and he should be honest in rejecting all cream that is defective and will not produce the best quality of butter. The tests seem to trouble the farmers more than the price of butter. They cannot understand why the tests should vary to such an extent from day to day. Cream is simply fat mixed with skim milk,

and the more skim milk you have in the cream the lower it will test. The separator man comes along and tells the farmer that if he buys a separator his cream would be uniform all the time, but when they run the separators at a greater rate of speed than they should be run they do not make a proper separation, and they find the same trouble as before. Both the speed of the bowl and the temperature of the milk go to affect the quality of the cream.

The cream should be thoroughly mixed before it is sampled, and the sample taken should represent the quality of the whole amount, and if you cannot get all the cream in one vessel then put it in two vessels and take separate samples of each of them. Sometimes the buttermaker does not handle his tests properly and does not ripen them before testing them, and very frequently the butter makers are to blame for the variation of the tests. When the samples are delivered at the factory by the cream gatherer they should be placed in a warm room which will be favorable for the development of the acid. and get them in good condition for churning. I believe it is advisable to loosen the corks so as to allow fresh air to get in to assist in the ripening. I think the butter makers should understand the ripening of cream better than they do at the present time, in order to get the best results. In some creameries they have from five to fifteen vats, and the man who is capable of ripening all this cream uniformly is certainly an expert. We ripen the cream for the purpose of developing flavor in the butter, and for giving it better keeping qualities, and also to enable us to get more exhaustive churnings and more butter from the cream.

I very strongly advocate the use of the alkaline test. That test should be used in every factory. Cream containing different percentages of fat will require to have different amounts of acid developed in them. I have prepared a table showing the amount of acid required to be developed in cream contaning the different amounts of fat, which will be very useful. Frequently in these creameries in the hot weather the cream is delivered in a condition ready to churn, sometimes containing too much acid. Sometimes we have to hold it over to the next morning, and the flavor is then spoiled on account of the development of too much acid, and to prevent this we find a very effective means is adding salt to this cream. When your cream comes in with sufficient acid or too much acid developed you cannot churn it at once, and the best means of handling it is to reduce the temperature as quickly as possible and add salt to prevent the development of further acid. That is a very cheap way of doing it, and there is no danger of injuring the quality of the butter in that way. In reference to collecting this cream some use large tanks and others use cans. For my part I favor the use of the cream tanks, because you can hold your cream at a more even temperature. I would also advise the building of ice boxes so that after the cream is put into the tanks the temperature will lower instead of raise. By wrapping the ice up in a piece of flannel you will be able to keep it all right till the morning. The greatest disadvantage in the tanks is that all the cream is mixed, and if one or two patrons are careless the bad flavor will be imparted to the whole lot.

The question of temperature at churning is a most important one. We find in these creameries we have usually to churn at far too high a temperature for good butter, simply because the cream is thin. Too high a temperature means butter too soft, and containing too much moisture, and butter without sufficient body to enable you to work it sufficiently without injuring the grain. The color is also usually pale and the high temperature causes an enormous loss of fat, and the lower the temperature of churning the more exhaustive is the churning. The size of the granules is also of some importance. We find that the larger the granules the poorer the keeping quality of the butter.

Now the salting and the working is of some importance, and we find as a rule that the butter is salted just a little too heavily. Years ago they used to salt the butter heavily because they kept it in warm rooms; at the present time we find that the market demands a better flavor, which means less salt, and we must have cold storage. We work butter for the purpose of salting it and for the purpose of expelling moisture, and the butter maker should know when it is worked sufficiently.

The system of working for a certain number of revolutions or for a certain time is altogether wrong. This past year we have received some complaints from the old country with reference to mould. Mould is usually caused by using boxes too green or improperly paraffined or not filled properly, or by putting butter in rooms that are too warm, or by not properly soaking the linings in salt brine or formalin. By experiments carried on in the United States they have proved that salt brine has an equal effect in preventing growth of mould as has that other stronger chemical solution. Now, if we are going to improve the quality of the butter we must make a drier butter with better keeping qualities. In order to do that we must have the cream richer and churn it at a lower temperature.

In reference to salting, we find there is a demand for saltless butter, and we find the less salt you use the more working you must give your butter. Saltless butter will stand double as much working to get it in the right condition as will butter that is salted properly. The more salt you have the less work your butter will require.

I advocate a system of selling regularly. We have not cold storage in our creameries suitable for holding butter ; there are few of them where the temperature can be maintained under 36 degrees or 38 degrees. If you cannot maintain that temperature you should ship it out every week or every two weeks. If you go through these large creameries in the north you will see hundreds of packages of butter spoiled before they are ready to market simply by being held in these warm storages, and that is the fault of the salesmen at the factories. I had occasion some time ago to visit a cheese factory, and we figured out the amount of money received by the patrons for the past fourteen years, per hundred pounds of milk, and it averaged just a fraction over seven cents per hundred pounds for the past fourteen years. Now, then, you farmers who own cows that are producing three thousand pounds of milk per year, and if it is costing you twenty or thirty dollars a year to keep that cow, figure your profit from that standpoint, and you will find you must improve your herds and get better cows that produce more milk.

There is one other matter I want to refer to. We have a great number of farmers making butter at home, and I think that system should be discouraged by all possible means. Not that good butter cannot be made by that system, but what I claim is that if you have twenty or thirty farmers in this district making their butter in that way you will have as many different kinds of butter, and no buyer is able to get any large quantity of uniform butter, and we can never hope to raise the standard or quality or raise the price of our goods by making butter on the home dairy system. And these farmers are only enabled to make butter at home for the reason that their neighbors are patronizing the cheese factories or the creameries and their goods are exported from this country. If the immense quantity of butter that is shipped from this country was all put on the market, as it used to be years ago, the price would be so low that you could not engage in the business. I even go so far as to claim that the money being spent at the present time through the channels of Farmers' Institutes and travelling inspectors in educating these farmers as to how to make butter at home, more especially in the districts where factories are organized, could be much better spent in teaching these farmers the profits and advantages of creameries, and that would be more effective in improving the quality of the goods and increasing the revenue of the farmers.

We find that the authorities of towns and cities find it necessary to maintain a very strict supervision over the dairies furnishing milk to the citizens in order to protect the health of the consumers of milk, and I ask why it is not just as necessary to maintain the same supervision over the dairies supplying milk and cream to our factories, in order to prevent the milk from becoming contaminated at home? It would improve the quality of our goods and increase the price and the revenue to the farmers.

A Member : What is the best feed to give cows ? We have had a great deal of trouble with turnips; some farmers will persist upon feeding turnips.

Mr. Smith : Some of you already know my views on that question. While I think turnips are excellent for young stock and dry stock, they should not be fed to dairy cattle. Some farmers say they feed turnips to cows and they cannot smell it, they have become so accustomed to the smell of turnips that they lose their sense of smell in that particular regard.

Mr. McFarlane : I suppose you do not know how to feed turnips. I will tell you how to feed turnips.

Mr. McLeod : I do not think we want to know anything about how to feed turnips. I would like to ask you if you have had any experience with testing cream with the Babcock test and the oil test.

Mr. Smith : We have discarded the oil test and replaced it with the Babcock test, and instead of measuring by inches they weigh it and take a sample. I am not prepared to advocate doing away with the oil test, because it has given good satisfaction and answers the purpose; yet I think the time will come when we get more skilled gatherers and better educated makers and then I think the Babcock test will replace the oil test.

Mr. Wenger : I find that near London there are a number of farmers who have hand separators, and who are making butter and putting it up like creamery butter, and selling it at 17 and 18 cents when it should be sold at 21 and 22 cents. If you want to sell your butter as creamery butter patronize the creamery, and if you want to sell your butter as creamery sell it in a fair way. You will never build up an industry in this country by fraud. (Applause.)

CONTINUOUS PASTEURIZATION OF MILK FOR BUTTER-MAKING.

By Prof. F. C. Harrison, Bacteriologist O.A.C., Guelph.

In March, April and May of last year the dairying and bacteriological departments of the Agricultural College together completed some work on the pasteurization of milk, and I desire at this time to present to you only the data which more particularly refers to the bacteriological side of the question, and the reason why we should pasteurize at certain temperatures. During the last five or six years this has become a very keen question. You may have noticed from the dairy literature that the Danes pasteurize about 95 per cent. of their butter, and if such a leading dairy nation as the Danes think it advisable to pasteurize the butter there it would be a benefit to use to enter into this method of preparing milk or cream for butter-making.

Pasteurization may be regarded in two different ways, I think, from the standpoint of the milk dealers and also with regard to the standpoint of butter-making, and I wish to discuss it in reference to pasteurization with continuous delivery machines. The experiments were as follows : Milk was pasteurized in continuous delivery machines at different temperatures of 140 degrees, 160 degrees, 185 degrees and 195 degrees. The interest in the bacteriological department was to note the number and amount of bacteria that were left in the milk at these temperatures compared with the number in the original samples. During six months and also during the winter we find that the number and character of the bacteria in the milk is very great and very bad, much more so in the winter than in the summer, so that we are more liable to have a bad infection in winter than in the summer. The reason is that the stables are very often close, badly ventilated and dirty, and that the germs from particles of manure or from straw or hay fodder, or any other dusty fodder that may be used, contain a large number of bacteria, and every movement in the barn causes a larger or smaller number of these undesirable bacteria to get into the milk, and there they find the best conditions for development. You may have been told how these bacteria increase, and this increase very often takes place in about half an hour. If we started with a single germ at the beginning of an hour, at the end of half an hour we would have two, at the end of an hour and a half eight, and so on, and you will

find that at the end of twenty-four hours you will have between sixteen and seventeen millions and thus they go on reproducing. These charts show you the number of bacteria that are alive in the milk when pasteurized at the different temperatures. Pasteurized at 140 degrees F. there were 15,776 bacteria per cubic centimetre (16 drops), and frequently these bacteria are of a very desirable character. Pasteurization not only kills the injurious forms but kills the beneficial ; in fact the lactic acid germs are the first to succumb. In pasteurization we destroy both the good and the bad in order that we may subsequently put into the milk a good starter.

The comparison has often been made between the farmer and the dairyman, which explains the chief reason for pasteurization. The farmer cultivates his land and prepares his soil for the special crops he intends to grow; he eradicates as far as possible all weeds, and he selects with care a good variety of seed, from which he expects to reap as he has sown. The dairyman also prepares his soil, the raw milk, by heating it to such a temperature as will kill all or the greater number of bacteria which may be present, these being his weeds; then he seeds his milk with a selected variety of micro-organism found to produce a good flavor in butter, and he also expects to reap even as he has sown. These two points, first, the preparation of the milk by pasteurization, and, secondly, the seeding with selected races of bacteria, have enabled all makers to secure the great desideratum, uniformity of product, which is of such importance to both producers and consumers.

In adition to this uniformity the butter-maker is incidentally able to drive off certain unpleasant odors that may be present in the milk supplied to him, and the keeping quality of his product is thereby increased, because he has killed the larger number of the harmful bacteria, which, if they had remained living, might have impaired the quality of his butter.

We find that 140 degrees is too low a temperature to pasteurize, and these germs will go on developing, and the next temperature we pasteurized at was 160 degrees, and you will immediately see the greater efficiency of that temperature ; and there are some 321 bacteria per cubic centimetre left after the pasteurizing at that temperature. The next temperature was 185 degrees, and there are but 80 germs left per cubic centimetre, and that temperature of 185 degrees had also been found to kill the tuberculosis germs in milk. These are the germs which produce consumption either in man or animals, and this temperature has been found to kill the bacillus tuberculosis, the most resistant disease-producing germ found in milk; so that in addition to the greater purity that we have in pasteurizing at this temperature we also have added comfort and security from the knowledge that all disease-producing bacteria is killed at this temperature.

Summary.

1. Milk as ordinarily delivered at a creamery, may be successfully pasteurized. The milk used in these experiments was largely furnished by patrons who had but ordinary facilities for taking care of it. In the winter we receive our milk but there times a week ; in summer it is delivered daily.

2. On but two occasions was the acidity of the milk over .2 per cent. The acidity averaged about .17 per cent. There is danger of the milk coagulating when heated, if it contains more than .2 per cent. of acidity.

3. It was noticed that the lots heated from 185 degreees to 195 degrees produced more foam than those heated to the lower temperatures of 140 degrees to 160 degrees. This was most noticeable in the samples heated to 195 degrees. At 185 degrees, the foam was not sufficient to cause much trouble in handling.

4. By cooling the skim milk with water to a temperature of about 65 degrees immediately after it comes from the separator, we were able to return it to the patrons in excellent condition for feeding, even in hot weather.

5. The use of 10 or 15 per cent. of culture in the pasteurized cream enabled us to ripen the cream without any difficulty. The culture used was a lactic acid bacillus.

6. Pasteurization of milk at 185 degrees and the use of a pure culture is the best method of securing uniformity, keeping quality, and the mild flavor requisite for export butter.

7. The cooked flavor which was present in the butter made from milk heated from 185 degrees to 195 degrees, usually disappeared at the end of about two weeks. In one or two lots, heated to 195 degrees, the cooked flavor remained for some time. There is apparently no danger of cooked flavors on butter made from milk pasteurized at 185 degrees at the end of two weeks, or by the time it would reach the British markets.

8. The species of bacteria present in the milk when the animals were kept in the stable, were very undesirable. Many putrefactive and fecal bacteria were present, hence the necessity of keeping the stable walls and rafters well cleaned. A good coat of white-wash increases the amount of light, and gives a general clean effect to the stables.

9. The average number of bacteria per cubic centimetre (16 drops) found in milk pasteurized at 140 degrees F. was 631,046 and 160 degrees F. was 12,848, at 185 degrees F. was 81, and was at 195 degrees F. was 40.

PASTEURIZING AS APPLIED TO BUTTER-MAKING.

Mr. J. A. Ruddick, Chief of Dairy Division, Ottawa, delivered an address on the above subject, a report of which appears on Page 72 of the report of the Eastern Dairymen's Association.

Mr. Woolley : Which is the best pasteurizing machine ?

Mr. Ruddick : There are at least three machines that are in use in this country that do excellent work, and I am not at all afraid of mentioning them. There is the Reid, the Lister, and a machine made in Denmark, which has been used in this country to some extent. Any one of these machines will do excellent work. The Lister was really copied from the Danish machine.

J. H. Woolley : Can the creamery be run on a successful basis with hand separators in a territory sending cream to the creamery ?

Mr. Ruddick: I think it can. I happen to have charge of some twenty creameries in the Northwest Territories, which are all operated on that basis. That system has been adopted there, because there is no other system possible. The cream is, in some cases, brought forty miles, and we have no difficulty in operating these creameries successfully. I think we get as good prices for the butter as has been received anywhere in Canada. The trouble is, that where that system is adopted there is a tendency to keep the cream at the farm too long. It is easier to deliver the cream sweet than it is the milk. By the use of a cooling appliance to cool the cream there should be no difficulty in delivering it to the creameries sweet, and so that the butter-maker has full control of the ripening.

Mr. McLeod : Does pasteurizing the cream improve the quality of the butter ?

Mr. Ruddick : That is the object.

A Member : What difference would it make in using the alkaline test, as to the amount of acid before pasteurizing and after ?

Mr. Ruddick : The cream must reach that stage when it becomes thick ; that is really the curdling stage. You cannot pasteurize it successfully till after that stage is reached. We pasteurize about four-tenths of one per cent. to six-tenths. I am having quite a long series of experiments conducted on that point just at the present time. There is no difficulty about pasteurizing ripened cream, but just whether it is better to pasteurize and kill the germ or churn at once or to keep the cream for some time, we are not yet decided upon that point.

Mr. McLeod : I have been running a creamery on the separator principle this last summer, and have gone into the cream-gathering business, and I have come to the conclusion that pasteurized gathered cream was the only way of making a good quality of butter that will be suitable to put on the market for export or for keeping in storage.

We have been pasteurizing for the last couple of months, and I am feeling my way because I have not got any data to go by. The information Prof. Harrison has given here about temperature is entirely new to me, because I was under the impression that if we heated our cream more than 160 degrees it would be apt to have a cooked flavor, and I was also under the impression that we were destroying very much more of the bacteria at 160 degrees than Prof. Harrison represents. It is safe to heat it to 185 degrees, and that gives better results, I would like to do so. I would like to go as high as it is possible to go with safety, and then use the alkaline test to know exactly what amount of acid has gathered in the cream. I tried at five cubic centimetres of acid, and I find the inside of the pasteurizer is very much coated with casein or curd, and at seven or nine cubic centimetres, the casein is washed out clean.

THE LOSS OF CASEIN AND FAT SUSTAINED BY WASHING CURDS.

By Prof. R. Harcourt, Chemist, O.A.C., Guelph.

With reference to the question of the pasteurization of milk, I may say that a bulletin has been issued by the Agricultural College (No. 117) which deals with the whole question of pasteurizing milk.

For some time past much interest has been manifested in the question of the advisability of washing tainted curds, and the consequent effect upon the quantity and quality of the cheese. Some makers wash every curd, just after milling, whether tainted or not, claiming that they produce thereby cheese with better texture and a more even flavor; others are afraid even to wash a badly tainted curd, for fear of removing too much acid. To my mind, it is evident that washing curds will do two things : First, remove some of the bad flavors; and, second, decrease the amount of acid. It has been fairly well established that tainted curds are improved by washing, and that very fast working curds can be made into salable cheese by washing immediately after dipping. Indeed, in many cases, washing has been the means of saving many vats of over-ripe Monday morning's milk. In such cases, the water washes out much of the excess acid, and at the same time assists in cooking the curd. Some makers have hesitated to practise washing for fear of removing too much acid. Neither theory nor practice will confirm this. Warm water poured over the freshly cut curd only washes the surface and carries away acid and taints that may be adhering to it. It is impossible for the washing to remove all the acid, for the water cannot penetrate the cubes of curd. Even if the amount of acid is very much decreased, it very quickly develops again from sugar in the curd. Experience has shown that washed and unwashed curds are usually ready for the press in about the same length of time.

Recently it has been reported that cheese made from tainted curds which have been washed have developed their peculiar flavor when kept for some time. It is evident that washing does not go to the root of the matter and remove the cause of the flavor ; consequently, it is quite possible that the report may be true. But on this point, I am not prepared to pass judgment.

It has also been reported that washed-curd cheese has afterwards developed rough open texture. Possibly this may be due to salting too soon. Washing the curds tend to make them feel smoother and more mellow ; and, if salted when they have the same feel as an unwashed curd, they are very likely to be salted too soon.

Experiments have proved what most cheese-makers have thought to be true, that is, that washing the curd must remove something besides acid and taint, and thus decrease the yield of cheese ; but just what this loss is made up of is not known. The object of the experiment, the results of which I am going to present to you, was to ascertain what this loss consisted of, and where the greatest loss occurs.

The plan of the experiment was as follows : 800 pounds of milk was treated in the ordinary way until just after milling, when the curd was evenly divided and piled in the little experimental vats used in the Dairy School. Approximately, the curd was

piled to about the same depth as in the ordinary work in a cheese factory. One lot of curd was washed with as many pounds of water at 98 degrees F. as there were pounds of curd; and the other was worked along unwashed. All the drippings, including the wash-water in the case of the washed curd, from both vats were collected, and the percentage of casein (N. x 6.25) and fat determined in them. From the weight of the drippings and the percentages of casein and fat, the amounts of these two substances which had drained away from the curd were determined.

In order to ascertain where the greatest loss resulting from the washing occurs, we collected separately the drippings from milling to salting and from salting to taking from the press. The old upright press was used so as to press the cheese separately. The losses occurring during these two periods, which are given in the following table, are the averages of a number of determinations and not the results of a single experiment.

Losses in *Grams per 1,000 Pounds of Milk.

——	Before salting.		After salting.		Total.	Per cent. of moisture.	Per cent. acid.	
	Casein.	Fat.	Casein.	Fat.			At milling.	At salting.
Normal	12.3	25.3	70.6	54.1	162.3	32.4	0.93	1.24
Washed	81.4	251.0	49.1	36.6	421.1	32.5	0.98	1.04

* 1 lb.=453 grams.

It will be noticed that before salting the greatest loss of both casein and fat occurs with the washed curd, but that after salting the normal or unwashed portion lost the most. It is quite evident that the washing has carried away considerable casein and fat that was adhering to the freshly cut surfaces, just as it might be expected to do. It is equally evident, though, that it is impossible for the wash water to carry away all the taints or to remove the cause of the taint. With the normal curds there was a greater loss of fat in the press boards. The loss due to the washing, however, is small. Prof. Dean's experiments show it to be 1.1 pounds of cheese per 1,000 pounds of milk. The results, as given, figuring the casein and fat as two-fifths of the cheese, account for a little less than a pound of cheese for the same amount of milk.

Regarding the amount of moisture in the cheese, we could find very little difference between the cheese made from the washed and unwashed curds.

As the curd was divided after milling, the amount of acid present was the same prior to the washing. At the time the curds were salted there was 2 per cent. more acid in the drippings from the normal curd. This may be due to the washing away of acid, or, what is more likely, to a dilution of the acid by the water used in washing. At any rate, by the time the cheese was taken from the press, there was as much acid present in one as in the other.

These experiments show, what might be expected, that the greatest loss due to washing occurs at the time of washing, and that, at that stage of the process of manufacture, there is very little danger of removing too much acid.

Regarding the effect on quality, which is really outside the province of this paper, I may say that Prof. Dean's experiments, conducted during the past two seasons, with a large number of vats of milk, all go to show that there is no increase in quality of the cheese when the milk is of fair quality. There is no doubt, though, that with over-ripe milk, such as is often received at cheese factories on Monday mornings, washing is beneficial in removing the excess of acid and in helping to "firm up" the curd. What the loss of casein and fat is at this stage has not been determined; but time and again makers have been able to handle such milk successfully by leaving the curd as long as possible in the whey, and then washing

out the excess of acid, and here I have no doubt the improvement in quality will fully compensate for the loss in quantity.

COLD STORAGE TRANSPORTATION.

Mr. Wright, of the British Refrigerator Company, was invited to speak, and said: It gives me great pleasure indeed to be present at this convention. I had the pleasure of being at Whitby, listening to discussions there on these very important matters, and I find that a world of information is derived from attending these meetings and listening to these discussions. Your President has asked me to say a few words in relation to mechanical refrigerating, a subject upon which I can speak with some degree of authority, as I may claim the title of being the oldest refrigerating engineer in the country, and associated with the only company that is exclusively devoted to the manufacture and supply of that class of machinery. There seems to be some misapprehension with relation to the effect of mechanical refrigerating, with regard to the curing of cheese. I feel that if the gentlemen who addressed you on this subject looked more carefully into the matter they might have found that these difficulties, which they appear to have observed, really do not exist.

There is refrigeration and refrigeration. There are three principal methods in operation at present. There is what is known as the brine circulation system, the direct expansion system, and, the later and most scientific of all, the cold air system. It would not be practical in the short time at my disposal to enter into a discussion of these various methods. I suppose you have a general idea of the principles involved, and will say that both the brine circulation system and the direct expansion system work on the same method as is employed in heating a building, that is, pipes are put through the rooms in which the cold air is circulated the same as you circulate warm water to heat rooms. With the cold air system the principle is entirely different. There are no pipes located in the chambers whatever. The air is exhausted from the rooms, passes over specially designed coolers and returns back to the chambers. These coolers are composed of ammonia coils; that is, ammonia is the refrigerant employed, and is the medium that produces the cold.

Over these coils is circulated, by means of a pump, a continual spray of cold brine, and the air that is circulated through these coolers becomes thoroughly washed, in fact to a very considerable degree sterilized and is returned to the room almost pure and sweet.

The very important question of moisture is one that is engaging the attention not only of this convention but also that of the meeting at Whitby. The statement was made upon the platform yesterday by Prof. Dean that he was informed by a gentleman in Boston that curing cheese by means of mechanical refrigerating had not been successful. If you will permit me, I will try to explain why this was the case. We have not yet introduced the cold air system to any considerable extent in the United States; we have been operating it here for the past seven years, and we are just introducing it to our American friends now. The capacity of the air for moisture is determined entirely by the temperature; that is, the lower the temperature the less moisture the air will contain. If we have a number of pipes in a room, and that room closd up for twelve hours, the refrigerant that is in these pipes, whether it be ammonia or brine, will necessarily be very much lower in temperature than the regular temperature of the room, and the consequence is that you cannot have an equal temperature in the room.

The air that circulates through the room, coming into contact with the pipes, which are of a lower temperature, falls to the floor, and the warm air takes its place, and the result is that the moisture contained in that small thin strata of air is taken down, and in the course of a few hours all the moisture would be deposited in the form of snow or ice upon these pipes; consequently the hydroscopic conditions of the atmosphere of the room will be far below the normal point. We are told by the

authorities that the best results were where the temperature was about 75 per cent. saturation.

With the cold air system these difficulties do not occur because the cold air, in passing through the brine, parts only with the moisture it contains down to the temperature of the brine, and consequently you can retain in your curing rooms the hydroscopic conditions of the air at whatever point you desire.

Not wishing to take up your time unduly I will just add a word with relation to the isolation on board ships. The difficulty with cheese and butter on board ship has been a lack of proper ventilation. Of course you know they have not much room at their disposal ; consequently it becomes a very much more complicated problem to solve.

The matter was referred to us by Mr. Robertson, and we took it up, with the result that we advised the brine cooler, by means of which a very much larger space than we had ever before attempted in the matter of refrigeration was accomplished; that is, we did not require to insulate the room so thoroughly.

Isolation is a very important matter in the cold chamber, and every inch you take away from the side of a vessel is a very important matter for the owner. The problem presented to us was how to give us a temperature of about 60 degrees and not encroach unduly upon the cargo space. I am pleased to say that we were successful in accomplishing that, and I have been informed that word has been received from the dealers on the other side that all the cheese sent over in these refrigerating chambers was received in the best possible condition, and they would advise all cheese and butter to be sent forward in that way.

The Chairman : This subject has become such an important one now, and especially the latter portion of it, namely, refrigeration on board steamers, that it is a subject I would like taken up in the form of a resolution at the close of this afternoon's session. As Mr. Wright will tell you, the accommodation that has been provided on ships is a very limited accommodation. The demand for it is considerably in excess of the accommodation. The people who have used it are delighted with the results. The cheese that have been shipped in these cold chambers have arrived in splendid condition for the market, have lost less in weight, and have been in such condition that our customers on the other side insisted upon the cheese coming in these ships if possible, and I feel that it is in our interest as dairymen to memorialize the Government, asking them to give us increased accommodation on ships at sea. The ship owners will not provide it entirely at their own expense, and we have to look to the Government to get the ship owners to provide accommodation.

Mr. Ruddick : In connection with this matter of providing cool chambers on ships, I think I am justified in saying that the Minister of Agriculture, the Hon. Sydney Fisher, has intimated that he hopes to have at least twenty-five steamers fitted with such service during the coming summer. (Applause.) That would make a very great deal of difference in carrying our cheese to the old country markets. I am not able to state that positively, but he and Professor Robertson hope they will have that accommodation, and I am sure that any resolution, coming from such an important body as this Dairymen's Convention, would have a very considerable effect.

Mr. Derbyshire : We have passed a resolution in the east, thanking the Minister for what he has done, and showing him the good results that have been accomplished by what he has done ; but urging him to have every ship that leaves Montreal, carrying butter and cheese, fitted up in that way. We want the very best service in this country. The Government is ready to do it if we ask for it.

The Chairman : I am exceedingly pleased to hear what Mr. Ruddick says. One of the greatest difficulties we are likely to meet with is this, that to the ports of London and Bristol the ships carry immense cargoes, and the space, as it is provided, will accommodate about six or seven thousand boxes only, so that frequently only one-fourth of the cheese that would be in these ships would have cold storage accommodation and three-fourths of it would have to go in other storage. So you see we want increased storage on those provided at present. We want a lot of cheese stored on the Bristol

and London boats. We want refrigerator cars from the point of shipment in the country to the seaboard, as it is at present you cannot get it. The railway companies have not sufficient ice stored to ice the cars, and if they are iced at the points where they can be iced, and then shipped up the country forty or fifty miles to be loaded, by the time the cheese is in the car the ice is melted. The ice is not handled the way it should be; there should be icing stations in different parts of the country, and the cars iced at these points. We realize more and more that the cheese industry suffers more from heat than anything else. If we can keep the cheese at a cool temperature all the time we would have a better reputation and the cheese would weigh more.

CREAMERY AND CHEESE FACTORY BUILDINGS.

Mr. J. A. Ruddick, Chief of Dairy Division, Ottawa, spoke upon the above named topic, taking up the same ground as that covered in his speech on this subject, to be found on page 19 of the report of the Eastern Dairymen's Convention.

Mr. Smith: If you would put a wooden floor over the cement, would you leave an air space?

Mr. Ruddick: I would have that space filled with some material. In building a refrigerator, the best finish I know of for the inside is a coat of shellac. It hardens quickly, and there is no smell from it. It makes the best finish for the inside, and the wood will not absorb moisture, and it is easily cleaned. The one of all advantages we have in our creamery refrigerators is to keep them sweet and clean. There should be an ante-room, so that when the door is opened it will not let the warm air in so rapidly.

Mr. W. E. Wilson: Is there any trouble from mould in a basement curing room?

Mr. Ruddick: There is a question of moisture. If the room is so constructed that the moisture gets into it there will be trouble in that way. I think one way in which a basement curing room might have a good deal of moisture is because a basement curing room is cooler than the outside air, and if the walls and windows are not made tight the warm air will carry the moisture with it. You should prevent the air from getting in from the outside; you should have double windows and double doors, and they should fit tight.

Mr. Wenger: Make your sash double; have glass on each side, and you will have an air space and will still have the same light.

THE MARKETING OF CHEESE AND BUTTER.

By Andrew Pattullo, M.P.P., Woodrtock.

One would suppose that a man who runs a newspaper and who had a few other things in this world to attend to had trouble enough on his hands without having given to him a subject of this sort. The other day, when I saw this subject with my name attached to it, I said to myself, "An enemy has done this," or if not an enemy, some jocular friends of mine, like the President or Mr. MacLaren. who want to see me in trouble, have done it. However, if, when I get through, you do not know more about it than you did when I started, I will have this consolation, that I have seen you discussing the same problems in connection with the dairy year after year for the last twenty or thirty years, and some of these problems do not seem to be solved yet. I look upon this question as almost an unsolvable problem. It is a very difficult problem, and I do not expect to see it solved by what I say or by the discussions which may take place upon it. At the same time, I think it quite possible that the gentlemen on the platform, and many in the audience, who watch these markets as closely as I have for a great many years, should lead solely if not directly to reform. I think that quite possible. Indeed reform must come. Improvements in the managements of our cheese markets must come if we are to progress as we should. Let me correct myself by telling you that I am

not going to offer much advice. I am not going to express any dogmatic opinions in the presence of you patrons or of the buyers. I will just say a few words by way of a starter, because that is really what I am. You have heard them discussing what a starter is in the dairy business, and a professor said yesterday that he only recommended the use of a starter when he had bad material, and that is the way they are using me this afternoon.

As I have watched the antics of these buyers and of some of the salesmen on these markets I have asked myself the question: Why is it that, after a great deal of trouble, desiring to benefit the dairy industry, having started these markets believing they were for selling of cheese, it transpires that cheese boards are just places where cheese are not sold ? They go and look at each other, but they do not buy or sell. They remind me sometimes of the starter at a trotting race, where the jockeys work by the hour, and where the audience is impatient, but there is this difference in favor of the race course, that the horses do get off some time, however long they may keep the audience, but these fellows never get off. (Applause.) The race between them is declared off, they leave the board and then the business is done on the curb stone or some place else where it is not seen. Now, if these cheese markets are not for the sale of cheese, why not give them up ? I think it would be a great mistake to give them up, because even in their present condition they are of some advantage ; for if you had not cheese boards the buyer would come and take your cheese, and you would have no information except the newspapers, which often come late, and which are sometimes delayed. Even if you do not sell your cheese at the board, they are of some value, because you can go there and find out how the market is. Why is cheese not sold upon the boards ? I am not going to answer that question directly. Some of you may think we have to be very deferential to these gentlemen. I am not going to be deferential to them, and I say the reason cheese is not sold upon the cheese boards is absolutely and solely the fault of the salesmen and those behind them. That is plain enough. That may not please the gentlemen, but I say it is absolutely true ; and let me tell you why I think it is true. Not that the buyers do not exercise a little influence in this, but I say the major influence and the responsibility rests with the salesmen themselves; because you have an organization there which is prepared for you, and if you want to sell your cheese on the board you can sell them on the board because you can resolve unitedly not to sell them anywhere else. If you put your heads and hands together, and put your hands upon your hearts and say, as a matter of honor, you will sell your cheese for what they will bring upon the cheese boards, what are the buyers going to do about it? They have to buy them there. But for some reason or other you pass a resolution to-day, and then you break your resolution to-morrow, and things go on just as they were, and you imagine that by private dickering on the curb stone or around town you will get more for your cheese than you will in open market ; and by that means you break down the market which is your protection, and which exists especially for your benefit. If you want these markets to be run let your salesmen unite and let your cheese be sold there and in no other way. I sympathize with the salesmen. I know they are watched by the patrons of the factory very closely, and I am told there is scarcely a salesman—and it takes a long time to make a shrewd, intelligent salesman—but there is somebody else among the patrons who would like to take his place; and the less a patron contributes to the factory the more captious he is about criticizing his salesmen, so that the salesman has no easy job . Let me say this to you, if you want to protect yourselves against these critics, who are often unjust, the safest way is simply to say, "I have gone to the board, I have put my cheese up when they were ready to be sold, and I have sold to the highest bidder," and my advice on that phase of the subject is that you should sell your cheese upon the board, and sell only upon the board, and in that way you are quite sure to get the highest price that the buyers can afford to pay.

I have referred to the fact of the salesmen being criticized under the present system, and I say they are much more likely to be criticized than if they sold on the open board. Let me show you how this system affects the maker. The buyers buy your cheese, agreeing to take them, but the bargain, as you know, under the present system

is never absolutely a bargain, and it is said about our friends the buyers that they sometimes buy cheese, and they are willing to take them on their own inspection when the market is going up, but they are not willing to take them when the market is going down. I am not going to say anything that would reflect upon the buyers here, and I am not going to give these gentlemen any taffy, although I will say this, that as I have known them they are very worthy and very honest, and have done a great deal for the cheese industry. There is certainly no business or industry in this Canada of ours where there has been so little commercial fraud or commercial dishonor among the buyers which has brought injury to the farmers as there has been among the cheese buyers and the firms behind them. It is simply remarkable how little we have heard about dishonor or loss in the cheese industry of this country. There have been a few isolated instances, but going back for thirty years it should be said, to the honor of the cheese trade, that there is very little dishonor. You have been selling your cheese with absolute confidence that you would get your money and not suffer any loss. Whether the buyers are justified in rejecting your cheese is a critical point I am not going to express myself upon. When they make the assertion that your cheese is not up to the standard, how that is to be met I do not know. Whether it can be met by previous inspection I do not know. Mr. Derbyshire will tell you that to some extent this evil has been cured in Eastern Ontario by the fact that there is an official arbitrator in Montreal, where the cheese can be inspected, and if there is a dispute between the buyer and the seller his pronunciation is made upon it and that settles the matter, and I understand some cases have arisen in which the salesmen have been protected by this official at the port of Montreal ; but all our cheese does not go to the port of Montreal, consequently there is a difficulty there. Whether there can be devised a system of inspection here I must leave you and the buyers to decide. I am inclined to think that if you adopt the system of previous inspection the details might be worked out. It may cost the Government of the Province or of the Dominion something to give you efficient inspection. The cheese district is a very large one, and for all the buyers to inspect all the cheese of the district before they want to buy it is to expect a good deal from them, perhaps it is to expect an impossibility, I am rather inclined to think it is ; but it seems to me we ought to be able to provide machinery for inspection in a case where there is a dispute. I know these gentlemen here and yourselves are better able to judge than I am. We have three extremely competent inspectors now, and could not they be armed with the power of inspection or arbitration ? But just let me warn you now with reference to some of the clamor that we have been hearing regarding this refusal of cheese. I have always felt that there was some fault to be found with the buyers, and it is this. We hear from them a great deal about the defects of quality in your cheese, and what surprises me is that they come on the cheese board and pay exactly the same for the cheese from those factories which are criticized as for the cheese made by the men who are making the very finest cheese. (Applause.) That is something that no fellow like me can understand, but we have observed it, and it has puzzled us. I believe that if these men, who know exactly what the product of the finest makers is worth, and who know exactly how much the product of some inferior makers is worth, would discriminate on the cheese board I think some of these faults would be cured.

With reference to the complaints of some of the patrons I have not much sympathy, because they do not contribute their fair quota to the making of cheese, and if the cheese is perfect I do not believe, even on a falling market, you are at all likely to find the buyers reject your cheese, and I will say that I have a great deal of sympathy for those men, on account of the risky character of the business in which they are engaged. No doubt they very often lose enormous sums of money; occasionally they make large sums of money. They are bidding on very close margins indeed, and it keeps them hustling to get anything out of cheese, and in the end I am satisfied that the patron gets all, and sometimes more than all, there is in it. I think upon the whole, the very highest price is paid by the buyers, and the whole history of the trade shows this. I think that where the buyers have made a bargain for your cheese

there are very rare instances in which they have rejected them where they were up to the mark, although there is a tendency among them to pay a little too high for their goods, and consequently there is a tendency on their part to inspect them very rigidly if the market is going against them.

We heard at Whitby, and you have heard to-day, something about the central curing stations, and it seems to me that in that way you will have a solution of this question. You have not got to the end of change and improvement in the cheese business by any means. You are learning every day you have been associated together. Why cannot you carry your co-operation a little further ? You have been talked to about your curing rooms and factory buildings, and been told what an ideal building ought to be. To me it has been a matter of amazement that you make half as good cheese as you do in some of the factories you have. You have heard that it is absolutely necessary to have a uniform temperature in the curing rooms. The buildings that you have, and the means of heating that you have, make it absolutely impossible to get that uniform temperature. One part of the room is hot and the other part cool. Would it not be a great advantage for some of you men to put half a dozen factories together, and have groups of factories all over this district, and have central curing stations, which are simply cool curing rooms for your cheese, where your cheese would be collected together as soon as it is made, and cured perfectly. That would facilitate this question of selling, and would solve the question of cheese markets absolutely. Who are to put up these curing stations ? I do not believe the buyers will do it; first of all, the buyers are not millionares. If they were they would get out of the business as quickly as possible. If they are acting for big firms, the big firms are not going to spend so much of their capital in buildings. But I believe the municipalities and the Local Government and the Dominion Government might be called upon in some way, and I believe these central curing rooms might be established, and it would create a spirit of emulation. It would give you an opportunity of contrasting; you would see how the cheese compared. I am strongly of the opinion that whatever your difficulties may be now, I believe the future will come through co-operation. I do not know whether these stations could be utilized for other purposes or not ; I think possibly they could. When they are not in use for cheese purposes I think perhaps they could be used for some other products of the farm.

I have been asked to say what is the effect on the salesmen, on the buyer, and on the patron. I have not answered these questions directly, but rather by way of suggestion. I think the maker is included here, and let me say one word for the maker. It seems to me that he comes out of this thing at the small end. In other words, the maker is the man who, under the present conditions, has to bear the burden. In the first place he is subject to criticism by all his patrons, and he is mostly criticized by those whose criticism is least deserved. If the buyer, rightly or wrongly, runs down your cheese, of course the reputation of the maker is gone. I think the position of the cheese-maker in this country is becoming more onerous and irksome than it should be. There is such competition that they are not very well paid, and they very often have to suffer a monetary loss. You ought to save your makers, because they are all trying to do their best. They are faithful and industrious, as a class, beyond expression. So far as I know these men cannot be too highly praised. I believe the makers of this district are working hard and trying faithfully to do their duty, and relief will come to them when you solve this question, as no doubt you will. This marketing problem is very simple if only the salesmen will put their hands together and carry out their promise to sell only upon the cheese board. I think in selling your cheese you should insist upon prompter delivery than you do. The difficulty seems to be that you sell your cheese subject to the whims of the buyers, who may take it immediately, or some two weeks or a month after it is sold.

The Chairman : This is a subject upon which a great many people have a great many different views. It is a subject which is engrossing the thoughts of the people of practically all districts, and it is a subject that has brought about different practices in this section. West of Toronto the practice is the same all over. Cheese are brought

on the markets, and the buyers go and inspect them and order them to be shipped on a certain day, and as soon as he inspects them they are shipped out. At Brockville the system is that the buyer goes up and buys the cheese on the board or on the street, and the salesman ships the cheese to Montreal and the buyer never goes near the factories. They are shipped as rapidly after they are sold as they can be got ready. When they get to Montreal the buyer pays for them if they are good ; and if they are not good he has got to prove that they are not good. He must get a certificate from a Government man, and he cannot have any reduction if the salesman is not willing to give it to him. The salesman has still the right to keep them if he wants to. At Perth the cheese come in on the day of the market, and are loaded in the cars or in the freight shed. The buyer buys them, and afterwards looks at them, and if he thinks they are good he passes them out. The system in Quebec is as follows : The cheese comes down on the Montreal boat and the buyer goes down and inspects them. The man who is there to sell them may represent fifteen to forty factories. They come in by the C.P.R. and G.T.R. and different boats. He buys them and the cheese are then taken to his warehouse. If any dispute arises, and the salesman is not willing to make a reduction, the goods are still his property, and he can take them and sell them to anyone else if he chooses. In the case of the Brockville cheese and the Quebec cheese they are all grumbling. The buyer thinks he gets the worst of it, and the salesman thinks he gets the worst of it. They are all trying to solve the problem.

Mr. D. Derbyshire : I was looking over Mr. Pattullo and thinking what a cunning salesman he would be, and how quick he would take his cheese off the board, and slip round on the curb and get an eighth of a cent more for his cheese. the same as the rest of the boys. (Laughter.) Of course the cheese business is a hard question. Providing I should drop into Woodstock on a market day, and providing I did not want to buy cheese, but I knew MacLaren really had an honest order, knew that he had received cables and had already sold the cheese and had to have six or eight hundred, do you know how I could punish our dear brother that day ? I could go right on the board and bid half a cent more for the good factories that I knew were all right, and then not another box of cheese could be sold on the board that day. They would not sell them for less money and you could block any of those buyers in half a minute. Even if I did not want to buy many cheese, I could destroy every other man who wanted to do business on this board. You ought to sell every box of cheese on the board for what you can get, and if you sold them for less money to-day than they were worth, do you think the buyers in this district would allow the other fellow to take them for less than they were worth the next day. Not a bit of it. If I were buying from day to day, and if I knew when I bought I had to take the cheese, I would know something about the quality of cheese, and the factory, and the ability of the patrons who furnished the milk. All these little details I would find out, and then I would buy the cheese for what they are worth, and the result would be that the factory that did not come up to the mark would have to go out of the business. In a great many cases cheese are not sold on the board because they do not want to give away their little details of quality. I have seen 9,000 boxes sold in Brockville in fifteen minutes. The newspaper man thinks this a great idea, and it comes out in the newspaper. It would be death to the poor little factories if they were sold for what they were worth on the board. If you want to improve Woodstock and give your board a name and standing in this country, you will sell every pound of cheese on the board. You take those good factories around here, and if you sell their cheese for what they are worth you will find they are worth a plumb cent and a half a pound more than other factories. Then, why not sell them for what they are worth, and sell the poor cheese on their merits ? That will come out in the paper, and bring up discussion, and it will bring about a revolution in the factories business that no other system will ever bring. (Applause.) I know how it is. Some fellow comes in and he says, "Derbyshire, take my cheese for what they are worth." The fancy factories in our district have no trouble about inspection, and I can say we have a large number of factories, and Mr. Ballantyne has received cheese from factories that he has had absolutely no trouble with at all, while with other factories he has had trouble every time

he buys cheese from them. You do not hear the factorymen who make fancy cheese say much about inspection—everybody wants their cheese. But it is the man who makes poor cheese who does all the talking. I presume that some day we will get this problem fixed so that we will all go to glory together, cheese boards and all.

Mr. Eagle : I am not a polished speaker, but so far as shipping cheese from here to Montreal goes, a few of us have done it, and I do not think we want to repeat the experiment. It is generally understood among the salesmen west of Toronto that if a man sells his goods on the board, if cheese goes up a cent a pound you have to deliver your goods, but if it goes down a cent a pound you cannot get rid of them, and that is a question I would like to have discussed. There is an impression abroad that there is a good deal of difficulty getting rid of the cheese when the price goes down, and I would like to know whether that is true or not.

Mr. Lockhart : I am not a salesman, but I have been identified with a cheese factory for a good many years, and have had some experience in this trouble between buyers and salesmen, and I have not been very well satisfied with how things are going on. I cannot quite understand the doctrine that we should come up to the market and sell our cheese on the board, and yet when we do so they are not sold. With reference to almost every other department of business, a sale is a sale : but in the cheese business it does not matter whether the buyer has any financial standing or not, or whether he is honest about it or not, the buyers can come in on the market and make a bid, and they can bid a price sufficiently high above their neighbor to get the cheese. It is marked down to them, and very often they leave it on our hands, and the companies have lost a great deal of money in this kind of way. It used to fall on the cheese-maker, but since we have got on to this trick of the trade we have sympathized with the cheese-maker and we have been disposed to distribute the trouble over the business a little more. I find Mr. Pattullo is a considerable admirer of the cheese-maker and the cheese buyer, but he has not too much to say with reference to the poor patrons. As far as I can see they have simply to offer their goods and somebody bids on them. I am disposed to believe that we have honorable men as buyers and honorable men as makers, and I think we have some honor in the companies, but I see there is something wrong in this matter. If, when the cheese were put on the board and sold they were sold, I would be quite willing to sell the cheese in that way, but we have to go there and sell our cheese, and then sit down and wait till they have time to refuse them, and I do not think that is proper. I do not see why sauce for one should not be sauce for the other. We will have to get an arbitrator appointed by the Government. I do not see why you should wait until the cheese gets to Montreal. I cannot see why they cannot see what our cheese are like, and buy them and pay over the money. That is what we want, and that is business. (Applause.)

The Chairman : I know Mr. Lockhart voices the sentiments of a very large number of the cheese men of Western Ontario. I believe myself that there have been some very great injustices done by buyers. I know of some individual cases that I think were simply scandalous; but in a great majority of cases there has been real and genuine cause for the rejection of the cheese. In many cases the buyers allow too much time to elapse between the time of purchase and rejection, and if the market declines a cent the loss comes very heavily upon the man who was selling the goods. If a system of central storage could be established, so that the cheese could be examined immediately after selling, practically all the difficulty that now arises would be a thing of the past.

Mr. Brown : With regard to what Mr. Derbyshire said about blocking the market, an instance came before our board that was very parallel. I think a large portion of that trouble could be done away with if the cheese was sold, but there is no cheese sold on the market until they are inspected, and in this particular instance the market was away above the proper price. There were four factories that did not sell, and those that were sold were rejected on account of the depressed condition of the market afterwards. I think a large proportion of this trouble would be overcome if there was some definite sale, something to bind the man who is bidding. Some men will come on the market, and bid anything for the purpose of stopping somebody else from buying, and then if he

did not want the cheese when he comes to the factory he simply says there is something the matter with them, and he can not take them.

Mr. Robert Johnston : I think the whole situation is in the hands of the salesmen. They should pass rules and stick to them. I think they should insist upon the cheese being inspected before they are bought, and then the buyer would have no reason for rejecting, and he would not come to the board to buy cheese that he had not orders for. A great many buyers are simply speculating. I do not think the salesmen of the factories should be speculators, and I think that if the salesmen would get together they could make rules and conform to them, and then the buyers would have to buy according to the rules. (Applause.)

Mr. Brown : Can you find a board that will stick to the rules ?

Mr. Johnston : It is the local jealousy among the salesmen that causes the whole difficulty. Here is a man with a factory where they do not make fine goods, and he does not want to take a less price than the man who makes the finest goods. If the cheese were sold on the open board we would know who made the finest goods.

Mr. Brown : In passing rules and regulations to govern any body, unless the members stand by the rules themselves, how are you going to enforce them ?

Mr. Paget : This discussion is perhaps as interesting as any question we have had before us. After listening to all that has been said this afternoon I do not know that we are any nearer solving the matter than we were when the discussion began. There seems to me to be a difficulty somewhere, and I believe both the buyers and the salesmen are at fault. I quite agree with the statement, and I believe it is right, and I believe it is the only method by which this matter can be made right, that the first thing to do is to have the salesmen agree, and have every board throughout our country agree, to sell the cheese on the cheese board at the cheese market. I also believe the buyers ought to be in a position to buy the cheese absolutely on this board. If it is necessary, let the buyers go through the country and inspect the cheese in the factory before the day of the sale, if it cost them a sixteenth to an eight of a cent more a pound to do that work, then give the salesmen what they can afford to pay, with the understanding that the cheese is absolutely sold when they are bought at the board. I believe if the salesmen would say, "We will sell our cheese on the board. and in no other way, and the buyers must buy them absolutely on the board"—I believe, if this agreement could be arranged between buyer and seller. the difficulty could be overcome. I believe the product of some factories is worth more than others. I believe there are factories in our country to-day whose cheese are worth a cent a pound more than that of other factories. Are they getting it ? We have poor factories getting within one-sixteenth of a cent of the price paid the best factories, but their cheese are not worth within a cent a pound as much, and do not believe that is right. I think those are things that the buyer and the seller will have to come to a decision about, and I believe the first solution of the problem is that there will be an agreement on the part of every man selling cheese that they will buy them on the board. and that they will pay the market price, and that when the cheese are bought they are bought, and that the buyer should know whether the cheese is right or not before he bids on them. If this trouble continues much longer cheese boards will be abolished, and it will go back to the old hole-and-corner way ; the buyers will drive around the country to the factories and pay you a quarter to half a cent less than the cheese is worth. I believe the market is the best system. The salesmen are intelligent, and they come to the market and know what to ask for the cheese, but in the other way the buyer goes to the factory, and perhaps takes the salesman unawares, and gets the cheese for a less price.

A Member : I think we need a Government man in Western Ontario. I think when the buyer goes to the Board he should put up some money on the cheese he buys, and when he goes to the factory and inspects the cheese, if his inspection does not suit the salesman or the cheese-maker they should be able to call this Government man, and he should decide the question, and if he decides in favor of the cheese-maker, and the buyer will not take the cheese let him lose the money he has put up.

Mr. Derbyshire : At Brockville we have a number of buyers that bid any price, but nobody pays any attention to them. The salesmen want to deal with the men who have done the honest thing with them, and that is what you will have to do here. Pay no attention to the man who pays an eighth of a cent above when you know he will not deal honestly with you. I would only sell to a man who could put up the money and do business in a proper way.

Mr. Pattullo : I desire to express the satisfaction I feel in the discussion we have had. I think I deserve your thanks for drawing out some of the gentlemen on the subject, especially my friend Mr. Lockhart. I heartily agree with everything he said. The buyers are able to look after themselves, and they have the first information. I believe Mr. Johnston has brought the whole matter in a nutshell ; the key to this situation is with the salesmen, backed by the patrons. The salesmen have the whole subject in their hands. Let the salesmen come to the board and sell only only upon the board, and let them say, "We will sell to no buyer who has not inspected our cheese." What is the use of saying, "Gentlemen, be good," when they won't be good. You cannot make them good by selling to anybody who has not inspected your cheese. The salesmen here and everywhere have it in their power to kill any buyer who will violate a contract. I am very strongly in favor of the central curing stations. Some of you will say, "What will we do with our present buildings?" I should like to see this system of central curing stations carried out, and that would leave your present curing rooms for another purpose. What purpose do you think I would put them to ? I would have every one of them fitted up as lecture rooms, and as board rooms for the meeting of the patrons, and I would have you meet all the patrons of the factory every time the inspector comes around. If that were done half a dozen times during the season it would be a great benefit. (Applause.)

Mr. Lockhart : I cannot see why we have the right to ask the buyer the question whether he has inspected our cheese or not. Let him buy the cheese. He knows the reputation of the factory, and let him take them at his own risk.

A. F. MacLaren : I simply want to say what I have said a thousand times before, and that is this : The salesmen have it in their own hands. If I want to sell I sell, and I do not go to work and have the buyer come and sell me and then reject the cheese. If I were selling cheese I would compel any man I sold to to inspect the cheese before I sold it to him. There is no use discussing this thing for an hour; the situation is in your hands. You can go to work and come to this board and say, "Gentlemen, I will sell to no person except one who will make this sale final." and that should be a person who has seen the cheese before.

Mr. Woolley : When he has bought them he should pay something on them.

Mr. MacLaren : I am willing to go around the country and inspect these cheese and go to the market and take my chance. I will not pay any money down, because if I buy a cheese I will take them every time.

Mr. Lockhart : If you make an offer of ten cents, why should you not take them whether you inspect them or not ?

Mr. MacLaren : If you are fool enough to make a bargain with me to buy them subject to inspection that is your fault. (Applause.) The buyers are willing to come to this board, and if you salesmen say you will not sell cheese to any buyer except one who will inspect the goods beforehand, then the buyers will inspect your goods.

A Member : Supposing you and several good buyers and a half a dozen others go to the factory and inspect these cheese, they will be all bored to pieces before they are sold.

Mr. MacLaren : I would sooner have a cheese bored to pieces than sell them on the market, and then have them rejected and thrown back on my hands.

Mr. Steinhoff : I understand Mr. MacLaren to say that they can be inspected, and then sold on the board afterwards. I do not think that is practical. It will often happen that several buyers will go to the factory and inspect the cheese, and they might not be sold that day on the board. They might not be sold for two weeks, and then the buyers would have to go over the ground and inspect them again.

Mr. MacLaren : I think it is practical. If I go around to inspect a lot of cheese before they go on the market, if they are not sold that day I will not have to go around before the next two weeks, because I will take my chance. Unless we have very severe weather the cheese are likely to be all right two weeks from the time I inspect them.

A Member : It seems to me that this matter of inspection could be settled. Why not ask the Government to appoint an inspector, and have cheese that are ready to sell inspected, and then sell them on the board ?

JUDGING THE CHEESE.

By A. F. MacLaren, Stratford.

I may say I am delighted to see so many dairymen here to-night, and so many dairy-maids. We have here on the platform the cheese that won the prizes, and I have the names of the winners, that is I have the numbers. I do not know who the exhibitors were. I will read off the numbers and Mr. Hately will give you the names of the exhibitors, so that you cannot accuse me of being partial. I do not know yet who took the prizes.

PRIZE LIST.

Class 1, Section 1. September White Cheese. 21 Exhibits.

1st prize to exhibitor No. 5, W. G. Medd, Medina.
2nd prize to exhibitor No. 18, W. J. Goodwin, Brussels.
3rd prize to exhibitor No. 23, T. O'Flynn, Tavistock.
4th prize to exhibitor No. 19, G. M. McKenzie, Ingersoll.

Class 1, Section 2. September Colored Cheese. 15 Exhibits.

1st prize to exhibitor No. 21, W. B. Thomson, Nile.
2nd prize to exhibitor No. 6, Frank Boyes, Kingsmill.
3rd prize to exhibitor No. 1, J. H. Williams, Lyons.
4th prize to exhibitor No. 15, Connolly Bros., Thamesford.

Class 2, Section 1. October White Cheese. 23 Exhibits.

1st prize to exhibitor No. 14, Frank Travis, Courtland.
2nd prize to exhibitor No. 15, Connolly Bros., Thamesford.
3rd prize to exhibitor No. 23, T. O'Flynn, Tavistock.
4th prize to exhibitor No. 22, Alex. McKay, Brooksdale.

Class 2. Section 2. October Colored Cheese. 15 Exhibits.

1st prize to exhibitor No. 20. Geo. A. Boyes, Putnam.
2nd prize to exhibitor No. 7, John Connolly, Malcolm.
3rd prize to exhibitor No. 14, Frank Travis, Courtland.
4th prize to exhibitor No. 17, J. J. Parsons, Jarvis.

In the September White Cheese
For finish 5 scored perfect.
9 scored $9\frac{1}{2}$.
6 scored 9.
1 scored $8\frac{1}{2}$.
In the September Colored Cheese
For finish 5 scored perfect.
8 scored $9\frac{1}{2}$.
2 scored 9.

In the October White Cheese
For finish 7 scored perfect.
11 scored $9\frac{1}{2}$
5 scored 9.
In the October Colored Cheese
For finish 3 scored perfect.
9 scored $9\frac{1}{2}$.
3 scored 9.

The highest score was 97 points, out of 100. I find great deficiency in the finish of these cheeses. In some cases where the cheese was almost perfect in flavor the finish was bad. One cheese particularly that scored the highest in flavor scored one point down in finish, and that should be a lesson to the man who made that cheese in the future to finish them better, and I think it will be a lesson to every one of these makers the next time they are finishing cheese. The flavor was bad in some cheese, and I wonder at the cheese-makers sending them here at all. They evidently did not look at them before shipping.

I have been asked to say a few words with regard to the Toronto Exhibition. I may say that I have the honor of being a Director of the Toronto Industrial Fair, and

during last fair I was Chairman of the Dairy Committee. As you all know, the dairy products were exhibited under the grand stand for a number of years, and I have been making a great kick, together with the Dairymen's Association, that we should not have one of our greatest industries under the grand stand. We have been kicking so hard that now they have arranged to build a grand dairy building, costing $14,000, some place in the middle of the grounds. The by-law carried that was placed before the electors of the City of Toronto granting $133,500 to improve the grounds and buildings. As far as I am concerned, I think the Toronto Industrial is the greatest advertisement Canada has, and I think it would be a great calamity to Canada to see that exhibition go. I hope to see a magnificent dairy building erected on the fair grounds this summer and ready for use in the fall. The idea is to have it for the purpose of exhibiting butter and cheese, and also for the purpose of exemplifying the manufacture of butter and cheese. We intend to have these products made there, through the whole exhibition, starting in the morning and keeping it up the whole day. I was very much surprised this fall to see the interest the farmers of this country take in going to see the object-lesson of making butter at the fair, and I am satisfied that if we give the seating accommodation for a couple of thousand people we will have them full all the time.

TORONTO EXHIBITION, 1901—PRIZE WINNERS.

Sec. 1—Cheese—June and July. 11 Entries.

	Prize.	Points scored.
Wm. A. McLaren, Avening	1st	95½ – 93½
Geo. A. Boyes, Putnam	2nd	94 – 93
M. Morrison, Harriston	3rd	93 – 93
Jno. Connolly, Malcolm	4th	95 – 90
J. W. Clarridge, Glen Huron	5th	93 – 91
J. S. Isard, Paisley	6th	93½ – 89½

Sec. 2.—Cheese.—June and July. 13 entries.

J. W. Clarridge, Glen Huron	1st	95¼
R. W. Thompson, Springbrook	2nd	94½
J. S. Isard, Paisley	3rd	91¾
M. Morrison, Harriston	4th	91
J. R. Burgess, Bluevale	5th	90
Mary Morrison, Newry	6th	89¾

Sec. 3.—Cheese.—August. 38 entries.

Mary Morrison, Newry	1st	97
G. E. Goodhand, Milverton	2nd	96
W. A. McLaren, Avening	3rd	95¼
Geo. A. Boyes, Putnam	4th	93½
J. S. Isard, Paisley	5th	93
T. E. Whattam, Picton	6th	92

Sec. 4.—Cheese.—August. 42 entries.

R. H. Green, Trowbridge	1st	97
Mary Morrison, Newry	2nd	97
R. Elliott, South March	3rd	96½
Geo. A. Boyes, Putnam	4th	96
T. E. Whattan, Picton	5th	95½
G. E. Goodhand, Milverton	6th	95

Sec 5.—Truckle Cheese. 7 Entries

Mary Morrison, Newry	1st	96
W. F. Gerow, Napanee	2nd	93½
R. W. Thompson, Springbrook	3rd	92½

Sec. 6.—Butter. 13 Entries.

Isaac Wenger, Ayton	1st	97½
H. Weston Parry, Compton, Que.	2nd	97
J. C. Bell, Winchelsea	3rd	95½
F. J. Sleightholm, Strathroy	4th	95½
W. H. Brubacher, Fergus	5th	94½
J. Ireland & Son, Beachville	6th	93½

Sec. 7.—Butter. 12 Entries.

	Prize.	Points scored
Geo. Balkwill, Lafontaine	1st	96½
F. J. Sleightholm, Strathroy	2nd	95
John McQuaker, Owen Sound	3rd	94½
W. H. Brubacher, Fergus	4th	94
H. Weston Parry, Compton, Que.	5th	93½
Harry Heeks, Palermo	6th	93

Sec. 8.—Butter. 11 Entries.

Isaac Wenger, Ayton	1st	97
F. J. Sleightholm, Strathroy	2nd	95½
W. H. Brubacher, Fergus	3rd	95
Henry Heeks, Palermo	4th	94
J. C. Bell, Winchelsea	5th	93½

Sec. 9.—Butter. 8 Entries.

Mary Hunter, Rockton	1st	93½
C. E. Rogers, Dorchester Station	2nd	93
A. Hutton, Brampton	3rd	92
W. Parkinson, Jarvis	4th	91½
James Dolson, Alloa	5th	91
Mrs. N. Klein, Holstein	6th	90½

Sec. 10.—Butter. 11 Entries.

Mary Hunter, Brampton	1st	94
J. Dolson, Alloa	2nd	93½
W. Parkinson, Jarvis	3rd	92½
Duncan Stewart, Hampstead	4th	92
Mrs. Wm. Willis, Newmarket	5th	91½
Wm. Whitelaw, Meaford	6th	91

Sec. 12.—Butter. 17 Entries.

A. Hutton, Brampton	1st	96
W. Parkinson, Jarvis	2nd	95½
Chas. E. Rogers, Dorchester Stat'n	3rd	95
Wm. Whittaker, Meaford	4th	94½
Mary Hunter, Rockton	5th	94
Duncan Stewart, Hampstead	6th	92½

Sec. 15.

C. Richardson & Co., St. Marys	1st	

I hope to see every dairy man take an interest in this Toronto Industrial Fair, and I hope to see every dairyman and the patrons of the factories and every factory represented with exhibits of butter and cheese. We are going to have grand accommodation for them. I myself personally guaranteed that the new building would be

filled with dairy products and dairy men, so I hope you will all back me up in trying to make it a success, and in trying to encourage the people to carry on the good work there by showing that we appreciate the new building which we are going to have.

TRANSPORTATION.

By A. F. MacLaren, Stratford.

You all know this transportation problem is the greatest problem facing the agriculturists of this country. I do not know of anything that is of greater importance to the people of this country. You may talk about making finer cheese and butter, but if you have to pay so much of your profits in transporting this butter and cheese from your farms to the markets in England I think it is a serious matter, and I hope the time has arrived when we can go to work and put our shoulders to the wheel and reduce the charges of transportation. We have been talking for years about appointing railway commissions to investigate this matter, but up to the present day very little has been done. I think now is the time that we should go to work and try to have this matter settled. I want to read some quotations and make some comparisons with regard to our shipments from Western Ontario and shipments from the same distance on the other side of the line.

Rates of Freight for 1897 were as follows :

Cheese—Montreal to Liverpool	21s. 9d. or $5.43 per ton
" —Boston "	13s. 3d. " 3.30 "
Butter —Montreal "	26s. 9d. " 6.68 "
" —Boston "	13s. 6d. " 3.37 "

Rates for 1899 were as follows :

Cheese—Montreal to Liverpool	23s. 6d.
" —Boston "	15s.
" —New York "	17s.
Butter—Montreal "	25s.
" —Boston "	15s. to 17s.6.d.

Rates for 1901 were as follows :

Cheese—Montreal to Liverpool	20s. to 22s. 6d.
" —Boston "	11s. 3d.

Bacon and Hams—Montreal to Liverpool.

Season 1899	15s. to 20s.
New York to Liverpool	10s. to 15s.

That will give you a little idea of American and Canadian rates. You see what a tremendous difference there is there.

The rail rates from points west of Toronto to Montreal average 33 cents per 100 lbs., equal to $6.80 a ton. Taking our exports for the year 1899, a comprehensive statement of which was compiled consisting of our leading staples of cheese, butter, bacon, hams, etc., apples and cattle there was, according to the Montreal Harbor report for that season, in minimum quantity exported from that port :

50,000 tons of cheese, 10,000 tons of butter, 50,000 tons of bacon and hams, 270,000 barrels of apples, and 46,000 head of cattle.

All of the above were carried by the railways from various points in Ontario, and investigation shows that the rate of transportation paid to these roads is more than 25 per cent. higher than for a relative rail haul upon American lines. Thus analyzing our railway and steamship rates and applying their excess charge over either Boston or New York the extra profit upon the above would be as follows :

50,000 tons of cheese, $3.50 per ton	$175,000
10,000 tons of butter, $4.00 per ton	40,000
50,000 tons of bacon and hams, $3.00 per ton	150,000
270,000 barrels of apples, 40c a barrel	108,000
46,000 head of cattle at $4.00 per head	184,000
	$657,000

This result is what these exports, via Montreal, have cost the Ontario producer for freight more than his American competitor paid upon a like quantity from either Boston or New York. But this is only a partial view of the picture. Almost as large a volume of these commodities, for want of proper shipping facilities and despatch from Montreal, was forced to find a way out by American railways to American ports, and upon which was paid $3 per ton for longer rail haul, which, added to the excess upon the Montreal volume will total more than $1,000,000 extra profit received by the transportation outfit upon this partial volume of our exports.

For the past season the exportable value of our cheese, butter and bacon represents $40,000,000, an amount considerably in excess of two years ago. In tons this volume would represent 250,000 tons, upon which we have paid out $1,000,000 for getting it to market. more than we should on the basis of American transportation rates, and our cheese has been handled largely in a condition that has depreciated its value another half million.

And thus it is all along the line with every class of our products, for example: The export wheat rate from Buffalo to Liverpool during the past year was 11 1-2c.

From Western Ontario points.. .. ..21c

Cattle Rate—

From Toronto to Portland.. .. ..28c
From Chicago to Portland.. .. ..28c
From Chicago to Montreal.. .. ..25c
From the Counties of Bruce, Huron or Grey ....33c to Montreal:

A carload of cattle from Listowel, Wingham, Lucknow or Kincardine to Montreal would cost $1.25 per head more than from Chicago.

You will probably, in your mind, be asking me what is the remedy for all this deplorable condition of things. I would answer you by inviting you to follow me for a few minutes across the line, to where our American friends have been doing things upon a most gigantic scale. I mean in regard to the development of their great 1,000-mile waterway between Duluth and Chicago, Milwaukee, etc., and Buffalo—a thousand-mile water haul. Twenty years ago, in 1880, the rail rate from Chicago to New York was 19 1-2c. per bus. In 1899 the rail rate from Chicago to New York was 11c. During the same period, by water, the rate was as follows :

1880.. ... ... 13 cents.
1899.. ... ... 5¾ cents.

This steady decline in rates, here shown as being the direct result of waterway improvement at the Soo and other channels.

Now, another interesting feature about these rates is the cost. According to undisputed authority the great volume of tonnage which now passes through the Soo Canal, and which this year exceeded 28,000,000 tons, was moved at a cost of 80-100ths of a mill per ton per mile. The average cost upon eighteen trunk lines of railway in the United States is shown to be eight mills per ton per mile, so that we have here an object lesson that the United States waterways from Duluth and Chicago to Buffalo, 1,000 miles, are carrying freight for one-tenth the rate of the railways running parallel thereto. In other words, the waterway is doing for $1 what the railways would get $10 for.

It has been estimated by those identified with the commerce of the great lakes that the 40,000,000 tons moved upon the lakes last year, west of Buffalo, if carried upon the basis of railway rates, would have cost the American nation $200,000,000 more than it did, and it is further estimated that at least 10,000,000 tons of the commerce passing through the Soo Canals would not have moved except for the facilities of water transportation. The railway charges upon it would more than equal its value at the point of destination. I have pointed out to you the activity that is to be found upon the American waterway—its marvellous development, and what a tremendous force it has been for the development of that country's western resources. I want you now to turn your eyes upon our own country and our own waterways,

and what is the conspicuous feature; that, although we have from the head of Lake Ontario to the seaboard a waterway unsurpassed and upon which we have, as a Province, contributed $47,000,000 for the improvement of the canals, etc., we have not a single steamship to haul our products to the seaboard. This is my answer and my solution for the condition that exists to-day in this country and the excessive railway tax that is being levied upon our Province—a Province in which our agricultural interest represents an investment of $1,200,000,000, with an annual output of $300,000,000 of wealth, wrung from its soil by the industry and labor of 1,125,000 of our inhabitants.

If this great problem of transportation is solved upon true commercial lines we will have two cows where there is one, we will have two families where there is one, we will quadruple our export and we will double our farm land values.

During the past year the rates of freight and insurance, via our Montreal port, have been so excessive as to be practically prohibitory. As an illustration : The rates for cheese from west of Toronto in Ontario have ruled about as follows to, say, London, England :

Via Montreal..	68.90 cents per 100 pounds.
Via Portland..	55.50 cents per 100 pounds.

Insurance via Montreal has run from 40c per $100 to $1.20 per $100, and via Portland 30c to 35c per $100.00. Why should the rate out of Montreal be 68.90, as against Portland's 55.50 ? Why should there be such a difference in the insurance ?

If you could distribute the extra freight rates that they are charging us in this country among the farmers it would buy a good many farms, a good many head of cattle and a good many boxes of cheese.

I simply give you these few facts and figures, which speak for themselves, and they are facts and figures which you cannot dispute. You can hunt up the blue books, and you will find that they are correct. I want to suggest that there should be some means of using our waterways. I do not think it would pay to put on freighters on Lake Ontario, starting at Hamilton or Toronto, because they could not get freight to make it pay, but I do say that if they use Lake Superior and Lake Huron and brought all this freight from the west during the summer season and transport it from Owen Sound and these other lake ports and send it right through to the seaboard we could do the same thing that they are doing across the line. If they can do it one side of the lake why not on the other. If we can save 25 per cent. on the products of this country in freights do you not think it would be a grand thing for this country ? I think it could be done, and I want to see the people of this country go to work and think about it. There is nothing in the world will tend to increase our population so much as getting our freight rates reduced.

I feel very serious about this subject. I think it is all right to talk about making more cheese and butter and raising more cattle and hogs, but why should we go to work and give one-quarter of it away ? And if we could use our waterways I think we could save that money. Of course, I think I know why our insurance rates are so high from Montreal. It is on account of the treacherous St. Lawrence route, and I think the Government should fix up that route. They claim they are doing so many good things. I think the sooner they make that route safe the better it will be for all concerned. I am only a humble member of the Opposition, but I will hold up both hands and do anything I can to assist in getting better transportation.

The President : The facts and figures presented by Mr. MacLaren are no doubt startling, and I know the rates are true, and I know the people of this district west of Toronto are more interested than the men of the east. I know you pay a much greater rate out of this section than the men out of the eastern section. I know the railway companies join together and agree among themselves to get a higher rate out of you by Montreal than they get out of you by Portland, and I know your cheese are tremendously injured by shipping by Portland. I have had a lot of experience. I believe we were the biggest shippers out of Portland this last summer, and I believe we suffered enough to pay three rates out of Montreal. In quoting cheese to our customers in England, if our quotation is six pence higher we cannot sell our cheese.

and it is necessary to quote our cheese by the cheapest route in order to sell them. The facts of the matter are that the C.P.R. use the St. Lawrence route and make that route by Quebec in order that they may make a competitive rate to get these goods by the C.P.R. and haul them to Quebec instead of Montreal.

In future we will have steamers with cold storage out of Montreal, and you had better ship your cheese by these cool steamers; but we want a cheap rate out of Montreal. It should not be possible for the C.P.R. to say to you we will take them from Quebec at a rate of 13c a hundred cheaper than we will from Montreal, and I feel that when it comes for the time for resolutions that there should be a resolution on that subject.

JUDGING THE BUTTER.

By I. W. Steinhoff, Stratford.

The committee has the following report on the butter which I have had the honor of judging.

Class 3. Section 1. Creamery Butter in 56 lb. Boxes. 17 Exhibits.

1st.—E. H. Johnston, Innerkip : Flavor, 43.50 ; texture, 24.50 ; color, 15 ; salt, 10 ; finish, 5 : total, 98.
2nd.—G. M. McKenzie, Ingersoll : Flavor, 43 ; texture, 24.50 ; color, 15 ; salt, 10 ; finish, 5 ; total, 97.50.
3rd.—Wm. Waddell, Kerwood : Flavor, 43 ; texture, 24 ; color, 15 ; salt, 10 ; finish, 5 ; total, 97.
4th.—Jas. Ireland, Beachville : Flavor, 43 ; texture, 23.50 ; color, 15, salt, 10 ; finish, 5 ; total, 96.50,

Class 2. Section 2. Creamery Butter in Prints. 18 Exhibits.

1st.—W. K. MacLeod, Vanneck : Flavor, 43.50 ; texture, 24 ; color, 15 ; salt, 10 ; finish, 5 ; total, 97.50
2nd.—Jas. Ireland, Beachville : Flavor, 43 ; texture, 24 , color, 15 ; salt, 10 ; finish, 5 ; total, 97.
3rd.—J. R. A. Laing, Avonbank . Flavor, 42.50 ; texture, 24 ; color, 15 ; salt, 10 ; finish, 5 ; total, 96 55.

The butter resembles in quality what I saw at the Pan-American, and considering that that was grass-made butter and this fodder-made butter, I think the exhibit is a good one. Every butter maker should take advantage of these exhibits to show his butter, so that he may be able to compare his make with that of other makers, and in that way see his defects if he has any. Butter in coming from the creamery to the place where it is exhibited is liable to take a flavor from almost anything surrounding it, and it might deteriorate on the way to the exhibition.

It might not be out of place for me to say a word or two in regard to the display I saw at the Pan-American. It was a very large one. We scored in two days 330 packages. There were only sixteen from Canada. But while the Canadian exhibit was insignificant in comparison in numbers, it certainly was not insignificant in the scoring which it got, and the standing which it obtaned. As near as I can remember I think there was only one exhibit out of that 330 packages that scored 98 points, and that came from Minnesota, while the highest score from Canada was 97 1-2, so in that we have nothing to complain of. In fact, I think we have something to feel fairly satisfied with.

Comparing this year's exhibit with last year's I cannot say that there has been an improvement, because I did not judge last year's butter, but from what I saw and from what a number of others saw of last year's exhibit we believe there is an improvement, and I trust that if I have the honor of judging again we will see a still further improvement, and I assure you that I heartily wish every maker of butter and cheese the utmost success in future, and that the quality will be steadily improving. (Applause.)

ADDRESS.

By G. C. Creelman, Superintendent of Farmers' Institutes, Toronto.

I have only time at this late hour to congratulate you upon the splendid attendance you have had from the beginning, and the splendid attendance you have to-night. I want to congratulate the Dairymen's Association of Eastern Ontario as well as of Western Ontario, because you have got to work together for the good of all and for the good of the country in general. I want to congratulate you upon the work you are doing, because in my position of Superintendent of Farmers' Institutes, travelling about from county to county, I have an opportunity of seeing just exactly what you are doing in the individual creameries and cheese factories of the Province. I want to congratulate the Dairymen's Association upon the support which they are giving the dairy schools at the present time. These three schools, your own school in Strathroy, the school in Kingston, and the dairy school at Guelph, are filled almost to their utmost capacity. And I am very glad that the young men of the Province are seeking these occupations. Times are changed very much from what they used to be. It used to be necessary for a young man to complete a thorough education; that he should go through the university and have B.A. to his name; but we have come now to a time in the educational history of the Province that a young man can in an agricultural profession, or any of these branches, bring just as much honor to himself and his parents, and to the country, as if he takes a course at one of our great universities. I am glad so many of the young men are taking advantage of the cheap courses at these institutions to prepare themselves for practical citizenship in this great country. The other professions are being overcrowded. The profession of law requires many years of hard labor from the student—from four to eight years in public schools, four in the Collegiate Institute, four years in the university and three years at Osgoode Hall. And when he is through he finds that there are lawyers in the large cities who are willing, after studying for sixteen or eighteen years, to give up their practice and accept a municipal clerkship at $600 or $1,000 a year.

The profession of medicine, one of the grandest professions, a profession which allows a man to do so much for the human race, is also being over crowded. The older men can remember that in your native towns and villages two or three doctors, and in some cases, one doctor, were able to do all the work necessary. Now, there are in towns of 3,000 of 4,000 seven or eight physicians. When our young men were called to go to the front to fight, to bleed, and if necessary to die in South Africa, 140 medical men offered their services to go with the second contingent, and it was believed by those who know, that even if their services had been accepted there would have still been enough doctors left in the Province to attend to any sick who might have remained home. Unless we wish our young men to seek some other country for a livelihood we should hesitate before we encourage them to enter these professions.

There is one more, and that is the honorable profession of public school teaching. Now it once was that a man went into school teaching with an idea of making it a lifelong profession. The time has come now when we have so many teachers that our boys seek simply to make that noble teaching profession a stepping stone to some other profession, and it is one of the saddest sights I have ever witnessed in going about the country when I drop into a school house in the afternoon, and find a girl sixteen or seventeen years of age, or a boy of the same age, in charge of the young girls and boys of that district. The competition has got so great that they are doing this, and I say it is sad to see our little children put in charge of such school teachers. We have nearly perfected the school system in the Province of Ontario, and we have got it in such shape that we have first-class school teachers in our high schools, and our boys are placed in such a position that they start to school early, and they can take these examinations and then they take three months at the

model school and qualify. So great is the rush for positions that a school trustee down in a town of western Ontario told me the other day this story: He said one of the saddest things in his life happened on the preceding day. He went on to say that as a member of the school board he was called upon to select an assistant teacher, and he said there was 76 applicants for that assistant position, and the salary only $230 a year. "Now," he said, "the sad thing to me was that 75 bright young men and women had spent the best of their lives in preparing themselves by hard work had to be turned down when the salary was only $230 a year." A young man of my own acquaintance in the town of Cobourg, a bright young fellow, a specialist in mathematics, a graduate of Trinity University, Toronto, at the head of his class in mathematics, he was what might be called a born mathematician, thought he ought to have no trouble in getting into one of our high schools as a teacher of mathematics, but when he came to make application he found the positions were all filled, and that young man after spending four years at Trinity University, was forced to accept a position on Manitoulin Island at a salary of $35 a month. And he went back there and buried himself at that salary. Now I think it is a hopeful sign that our parents are directing the attention of a lot of our brightest boys to such things as cheese-making and butter-making and back to the farms, where they have scope for all their genius, because there is no place where there is greater scope for the bright boy than on the average Ontario farm under the present splendid conditions. (Applause.)

I therefore congratulate this Association on taking up this practical work, and I hope you will go ahead and push it forward and get the farmers into closer touch with the butter and the cheese men, because I do not think they are as close as they should be. I have heard good practical farmers say that things go on in cheese factories that they know nothing of. They say the cheese maker talks about carbohydrates and albuminoids, and the farmer does not know what he is talking of, and he says they have infernal machines for getting butter fat out of the milk that we know nothing of. Now if we could get the practical farmer into the factory it will be much better, and if I can enable you to hold dairy institute meetings at the factories and in the creameries, and bring the farmer and the butter and the cheese maker together so they could talk over their troubles, I believe we could do a lot towards helping that great problem of how to look after the milk between the cow and the factory. (Applause.)

The Chairman: I have now great pleasure in introducing Mr. Eli Bourbeau, who will address you for a short time. He is a cheese instructor at St.Hyacinthe, and he is the most alive man in Quebec on dairy matters. He has had a lot of experience, and has been sent by the Government of Quebec to Europe. He has made cheese in England and has had his cheese imported to this country. It is unusual to have cheese brought from England to Canada, but he has had English cheddar cheese brought out to this country in order to compare it with the product of Canada.

Mr. Eli Bourbeau, St. Hyacinthe, Que: I think my first duty should be to excuse myself for not being able to speak English as well as I would like to, but you will admit that when a young man is born and brought up where there is not an Englishman it is very hard for him to speak very good English. I thought I knew before to-day what was the cause of the success of the dairy industry in Ontario, but I must admit frankly that I did not know. I knew that you had very good instructors, very good buildings and very good cheese makers, but what I learned to-night is that besides the instructors and makers there is a large crowd of intelligent farmers to back them up. I always hoped that we in Quebec would be able one of these days to fight with our friend Ontario, but I must admit frankly that I am afraid of victory to-night, and the reason is because you have the ladies with you. When I was over at the other side of the water at Paris and at London the Englishmen bought a lot of Ontario cheese. One man over there told me he had bought 1,000 cheese from Ontario, and that he had 999 of them all alike, and I think that is the best compliment that could be paid to this country. Before leaving you it is one of my duties to thank the people of Ontario for what they made of me in the dairy industry. I

first went to learn cheese-making under the Macpherson combination, where Mr. Ruddick was the instructor, and the second time it was in Brockville under Mr. Derbyshire and Mr. Ruddick was inspector. Some of you may think it was a bad thing for Ontario people to educate other people to make cheese like themselves. I think the contrary. I think Canada should stand like one man—(applause)—and the time is past when we have to speak of Ontario and Quebec, especially regarding the cheese industry. It may be useful for some politicians. We have lots of competition, and if we make bad cheese in any part of Canada the whole country will suffer for it, and the better cheese we make the more beneficial it will be for the whole country.

ADDRESS

By Hon. John Dryden, Minister of Agriculture, Toronto.

I am delighted to find that the interest does not lag in this Association, judging by the meetings you have held yesterday and to-day, and by this magnificent audience which greets us here to-night. I am glad that it is so. One would think that, after years of education and agitation, we would have arrived at the time when there would be no need for gatherings of this kind, and that we could go on our way, but that time has never come yet, and I want to say to you it never will come. New problems and difficulties are opening every year and we have to solve them.

I am delighted, Mr. President, to find you in the chair. When I first came to a meeting of this Association there was another Ballantyne on the platform. He is not here tonight. The President was one of the boys in those days, and we did not see much of him on the platform, but I am glad to know he is quite able to take his father's place, and that his interest is unabated in the cheese industry in which his father was so long connected in this country.

I find that there are those who say that danger faces us in the near future. The Hon. Mr. Fisher, on two or three occasions, has given us words of warning, and in speaking at the Dairymen's Association the other day at Whitby, he again issued a note of warning. In fact, he said it was his duty, and he felt pained in bringing it before the Association. His word of warning was this, that if something was not done we were likely in this country to lose our trade with Great Britain. He said that from the information that was brought to him as head of the department he learned that altogether too much of the cheese exported from this country was now arriving in what they called a bad condition. He told us there were various causes for this, and he mentioned some of them. It was enough for me to hear that there was any danger in this direction. It has troubled me ever since, and I have been pondering over it, and I have been thinking to myself, and saying to myself, "Is it possible in this young country, so full of energy and life and skill, that it could be said there is danger, after all our effort and education, of our going backward instead of forward?" And I also have said to myself, "Is there no way whereby we can hold this trade?" And I said, "Yes, there is, we can hold it, we must hold it." But then as I thought there came in that nasty little word, which bothers you a good deal and it bothers me, "If." "If what?" If every man connected with the trade will only do his duty. (Hear, hear.) I mean "every man" engaged with it, and so I began in my mind to forge a chain which would be long enough and strong enough to hold this trade with certainty, and after I got it forged in my mind—of course I was not in a blacksmith shop—after I got it forged I found there were seven links in it, and as a chain is no stronger than its weakest link, it meant that every link must be made as strong as possible if we are to hold the trade.

My first link, starting at the beginning, was the owner of the cow, because it is manifest that unless you have the raw material pure and clean no product can be put upon the market. And it is manifest too that the man who owns the cow

can spoil the milk very easily. He may spoil it by dishonesty. You all know how easy it is to have a pump to help him in this matter, but if he undertakes to use a pump he does that wilfully. But I want to point out that this man who milks the cow is liable to spoil the milk ignorantly, not understanding what the result of certain things will be. It is quite possible for him to spoil the milk by improper care and improper feeding of the animal. These are things you are accustomed to discuss. Most of you here know just as much about them as I do, but there are some people engaged with your factories who do not have the knowledge you gentlemen have. And they are ignorantly destroying the value of this raw material.

Then the man who milks the cow is liable to destroy the product also, and the scientists will tell you how certain bacteria and yeasts get to work in this milk. The man who owns the cow does not know this, and if he does not know it he ought to be made to know it, and he ought to understand it. But it is possible for the man who milks the cow to damage the milk and to destroy its value to a certain extent, and it is possible when he gets it in the pail and sets it down in the stable he will get germs which will destroy to a certain extent the value. And so this man, the owner of the cow, makes the first link in this chain and we must have it strengthened if possible. I will tell you how you do it. Sometimes you scold and you jaw this man right here in your convention, and you say nasty things about him, and I do not blame you. But will that reach him ? Or will you reach him if you undertake once in a while to punish him by law ? There is no use talking to him in these conventions, because he is not here. Some people say there are two classes of people who never need to go to school or college. One is a genius and the other is a fool. These men whom I am talking about are all men of genius, and they do not need to go to a convention because they know it all now. I do not wonder at Mr. Creelman's saying they talk about infernal machines. They think that somebody is trying to take something out of them all the time. Now there is no use in scolding the man. Even if you had him here you would hardly get anything out of him in that way. Men are liable to stand back in the harness. We are all made in the same way, more or less—and generally more. If you treat him in that way he will turn mulish—perhaps I should say donkeyish. I do not know which is the stronger term. I would like to use the very strongest. The Scotchman would call it "dour," he won't do what you want him to do. Mr. Creelman made a suggestion here. If it is only carried out it will make this link in the chain stronger than it is, and that is, if these men won't come to our conventions then you will have to go to them. I do not want you to wait until you are invited. There are hundreds of factories in the west that have never had an instructor. These are the people that need it most. We must press our suit upon these people, and make them understand they are partners in this concern, and that they have individual responsibility in this concern. We must let them know they are injuring themselves, and while injuring themselves, they are injuring everybody else and the country; and if they still rebel and will not change their methods, then I have got to say, according to Scripture, that you can withdraw from them, turn them out, refuse to have them as patrons to any cheese factory in this country, and tell them they are no Canadians or they would not take that ground. I will not acknowledge men like that as Canadians. If he will not learn when you try to teach him, then we must turn him adrift and let him go to grass for a while, and he will come to his senses. Some of them do not need to be reached. I am prepared at this meeting, and in your presence, to suggest that if he cannot be reached by our present machinery we must provide some other means, and I am prepared to say that I will suggest to my colleagues that we shall have a Government instructor to be appointed and paid and controlled by my Department, and I will see that these instructors get to the place where we want them. (Applause.) This is perhaps a bold thing for me to say. I do not want to take it out of your hands, but if you have not got money enough we must find money enough. We cannot let this trade slip, and we must make this link in the chain just as strong as necessary in order to hold this trade.

The second link is easier. The handling of the milk between the farm and the factory. Now it is quite possible if the milk is clean and pure when it is received by the man who transports it from the farm to the factory that it may be injured in his hands. If he loiters along the road and lets it stand in the hot sun too long, jolting it in the waggon, and so on, it is liable to be injured. And if he will not do the work properly then we must get somebody else that will; and they are so much fewer in number than the ones that compose the other link that it will not be difficult to fix this link, and it is very easy to make it strong enough to hold.

The third link is the maker, and I think I have a right to say that with proper care in selecting these men this link ought to be, and probably is now, the strongest one, and it seems to me the time has come when we can leave the makers of the cheese to the dairy schools, where they get proper instruction if they take it, and let us devote our attention to the other people who do not have this opportunity. The makers must do their work properly or otherwise our chain will not hold. I will assume that they are ready and prepared, and willing and anxious to do their part of it properly.

Then the next link is the curing of the cheese. Now you have been discussing this at this convention, and it was discussed a good deal in Whitby, and those who know most about it are telling us that the temperature at which cheese is cured means everything, and that we must have a cooler temperature, and here comes a new problem. If we must have a cooler temperature, why not set ourselves about to get it ? Whatever is wanted in the way of cold storage ought to be got. Mr. Fisher said that his Department was ready to help if you will only help yourselves. We have on the Statute books of Ontario a law by which you can secure assistance, and if any of you people go to work and put up a cold storage, if it costs you $2,500, the Ontario Government will give you $500, and I believe Mr. Fisher will help still further. I do not believe in helping people too much unless they help themselves. You are interested, because it means more money for the product which you are putting upon the market. Our bill only allows us to give $500, but we can give 1-5th of the cost until it reaches $500, and that is the most the law allows us to give. With a moderate amount of ice I think it is quite possible to have a proper cold storage plant. If you cannot get it in that way let us unite our forces and put one at such a point where a number of factories can utilize it, so that this link in our chain will be as strong as possible.

The fifth link in my chain is transportation, and I was delighted to hear my friend talk about transportation. I told him I was prepared to back him up in every part of it. First from the factory to the station. If the distance is short there is no difficulty, but if there is a long distance to go there is liable to be trouble, because the jolting waggons are not the best way to transport cheese, and sometimes they are carried in a very hot sun. We can get over this difficulty by having springs on the waggons and building some kind of covering to protect the cheese. This is an important link and it ought to be a strong one.

The sixth link is the railway transportation, and here we have to thrown down our hands and say we are perfectly helpless. We take what they give. We come to the railway, and we ask for a car, and we have to take whatever they give us, and so the individual men in this assembly are perfectly helpless. But so far as I am concerned, and my position will allow me, I am prepared to come to the help of the people, and I think we have a right to call upon the Hon. Mr. Fisher to undertake to help us as far as railway transportation is concerned. If the cheese is overheated on the cars you cannot expect to get it from the station to the steamship in proper condition. It is a matter than can be remedied. These railway authorities are very selfish, and look out for the dollars and cents, yet I find they are very susceptible to argument, and if you show them that by a certain line of conduct on their part they will bring more trade to the railway I have found they are very susceptible to argument.

My friend Mr. Hodson, the Live Stock Commissioner, knows we have gone to the railway in connection with live stock matters, and it is wonderful what they have of that kind.

done for us in this regard. Do not go to them individually. They will just listen to you and then smile, and say "Good afternoon."

Go to them through your Association. Let a committee of this Association and a committee of the Eastern Association, backed by the Ministers of Agriculture for the Province of Ontario and for the Dominion, and any other influential people you like, and say to them, "If you will do so and so it will make it so much better for us and for the railway." I believe in that way you can reach them. I know they are selfish, but we must have attention paid to us in this matter. They are like other men. We will have to get at them through members of Parliament, because we cannot let this trade go; and we must have freight rates, and cars built, so that we can get our goods to the market in proper condition. And I will back up my friend who read this paper on the question of transportation.

When we have got over the difficulty with the railway company we meet another. We come then to ocean transportation. We have never been treated fairly by these steamship companies. It seems they are the most selfish of any corporation we have to do with, and if they can get freight enough for their ships your cheese can go to the bottom of the ocean for all they care. And they do not care about giving you cold storage compartments if they can get the ships filled with something else. We have talked about public ownership of great franchises, we have talked about public ownership for telegraph and telephone. It seems to me the most pressing thing in this country is for public ownership of steamship lines, which shall be run in the interest of the country, and not in the interest of millionaires who live across the sea and who do not give a button for you or me. (Applause.)

I am prepared to go to any length; and I have often thought if I was in a position when I come up to this question of transportation I could do more; but I am told to step aside, as that belongs to other parties. However, I have often thought I would like to have a hand in it. If I did I think I would say to these people, "We are going to have better service or we will have another line. You can take your choice; but we are going to have better service." I say we have never yet had the service we ought to expect. They tell us they have cold storage. I remember in the old days of Sir Charles Tupper he told us on the platform we have cold storage for you, and here we are to-day complaining of it all these years. We are complaining still that it is not what it ought to be. I do not know who is to blame, but I say we have never had fair play from these steamship companies who are reaping such enormous wealth from this country.

These are my seven links in the chain. Commencing with the owner of the cow and going right through. Everyone of these links ought to be and can be made strong enough to hold this trade. The only question is, are we prepared to join hands and try to weave these links so that they will hold together ? I am prepared to do my part. Are you prepared to do yours ? Will this Association do its part ? Will the instructors do their part ? And shall we reach the people and influence them in such a way that the product will be better than it was before ? It ought to be more uniform than it has been, and it ought to be put upon the market in a better condition, and if that is done there is really no danger of our losing our trade with Great Britain. If the market has changed, we must change with it. We cannot afford to be conservative in our methods with the world. Do not forget that the only way to reach wealth in this way is to produce not once or twice but all the time a special article and get it upon the market in a proper condition, and if we can do that we shall hold our trade, and secure riches and contentment, wealth and prosperity. (Applause.)

Mr. Pattullo: Mr. MacLaren has given you some important facts and figures. Although the subject is a little outside the ordinary work of the Convention, these facts and figures are such that you should consider them, and, with the remarks of Mr. Dryden upon that subject, I think it is one of the questions upon which you dairymen can influence the Legislature and the public men of this country, and the Parliament of the country. One of the greatest problems of to-day in this country is this great question of transportation. Let me say one or two words in addition to what has been

said. We are subsidizing a number of steamship lines, and I say we should subsidize no steamship lines unless we have a regulation as to their freight rates, and I think we should press for a railway commission. I do not think it will work miracles, but it will improve matters. In the deepening of canals we are endeavoring to solve the problem. "Rome was not built in a day." There is a great deal to be done yet, and we should pay the greatest attention to what has been said by my friends, Mr. MacLaren and the Hon. Mr. Dryden. Has this not been a splendid convention? You are all delighted, I am quite sure. I have been more than delighted with this, and I have been delighted with the kindly expressions which have come from the members of the Board of this Association at the reception they have met with in Woodstock, at the way in which our Mayor and members of the Council and Board of Trade and others have received you. We have only been doing our duty in that respect. We have not, perhaps, done our whole duty, but I venture to say no one man or woman has come to this Convention without going away the better for it, and you will go away better and wiser men and women, whether you are dairymen or not. These Associations are doing noble work. Some of the old men are passing away, but we are bringing out young men in their places.

Now just one word with reference to what Mr. Dryden said. I was more than delighted with an observation he made on one of the links in his chain. It was a perfect chain, and he emphasizes what I was saying this afternoon, that if you want to get at the bottom of the question of making cheese, you have got to get to the patrons. There is the weakest link in the whole chain. And I repeat the suggestion that I made then, because if there are 100 patrons sending milk to a cheese factory and 99 of them are of the right sort and one of them is sending bad milk, the efforts of 99 are spoiled and annuled by the work of the one. If you are going to educate them all, how are you going to do it ? You have to get at them through the inspectors, through the buyers, and I say convert your curing rooms into lecture rooms, have frequent meetings there, and if these patrons won't do what is right talk about them in such a way that their ears will burn every day in the week, and you can go there and talk things over, and you will find out your mistakes, and you will know what you are doing, and what the cheesebuyers are doing, and the condition of the market.

I was glad to hear what Mr. Dryden said about the willingness of the Government to give you more inspectors if you want them, and I say build these lecture rooms in every section, at every cheese factory, and then that educational chain I was describing last night will be complete, and you will start with the patrons and work up until your cheese has landed in Liverpool on the table of the British people.

Speaking of the educational influence of the people, let me say a word in conclusion. There are some people who have not been here to-night, who have not been here this afternoon, that I would have liked to see here. Mr. Creelman spoke words of wisdom about the tendency of the present day towards the farm or away from the farm. You remember what he said, "I want to see the boys and girls of the town have their thoughts turned that way rather than otherwise." This is the hope of the country, and I should like to see every high school student in Woodstock attend the session of this Convention. It would have done them good.

ONTARIO DAIRY EXHIBIT AT THE PAN-AMERICAN EXPOSITION.

Mr. J. N. Paget read the following report, on behalf of the committee appointed to make an exhibit of Ontario cheese and butter at the Pan-American Exposition :

One clause in the report of the Directors, at the opening session, referred to the attitude of the Board of the Association in regard to the Glasgow and Pan-American Expositions. While the Directors might not be justified in employing any of the moneys of the Association in promoting dairy exhibits at these Expositions, they were willing to do what they could in assisting to select cheese or butter should the Governments decide to make at exhibit at either or both of such Expositions. The views of the Board were laid before the Ministers of Agriculture both at Toronto and Ottawa. Finally, the De-

partment of Agriculture at Toronto appointed a committee, composed of members of your Board, viz., Messrs. Wenger, Eagle, the Secretary and myself, to arrange for an exhibition of cheese and butter from Ontario, both East and West. One reason we were selected to act on the committee was on account of our living not far away from the Exposition, and that we could therefore give personal attention to each of the exhibits without much expense either of time or money.

The limit given to us for expense, and that we should not exceed, was such that we could not see our way to exhibit at more than two of the four competitions, but the Department of Agriculture at Ottawa came to our aid by assuming all the cost of transportation, enabling us to make displays in July, September, as well as in October, as we first intended. The first meeting of the committee was held on the 4th of June, immediately after which nearly two thousand circulars, explaining the proposal, were issued to the cheese and butter makers of Ontario.

Entries for the July competition were received from 113 makers for 125 exhibits of cheese and 54 of butter. It was announced that the exhibitors would be paid for the cheese and butter forwarded by them for competition, at the market price at the time of shipment, and it was asked that duplicate exhibits should be sent. Arrangements were made to receive these exhibits at the Toronto cold storage companies, and Messrs. Ruddick, Muir and Millar kindly accepted an invitation to act as judges in Toronto, and to select such cheese and butter from the exhibits sent there as they considered good enough to send to the Pan-American. Unfortunately the very extreme and long-continued heat in the latter part of June affected the cheese in the curing rooms to such an extent that only about one-half of the cheese entered was sent forward to Toronto. Even of the cheese that were sent forward some showed signs of heat. This seems to bear out the contention that some better method of caring for the cheese after they are made should be provided. The same method of making selections was adopted in September, and also in October. The September and October exhibits were uniformily excellent in quality, especially those in October, of which not one was rejected. In September 86 exhibitors made entries of 140 cheese, of which 66 were sent to Buffalo, and in October 85 exhibitors entered 122 cheese, of which 74 were sent to Buffalo. In butter there were 35 entries made in September by fifteen exhibitors; and in October, 31 entries by fifteen exhibitors.

In September and October Mr. Ruddick was not able to assist in making the selections, but the work was done by Messrs. Millar, Muir, and Steinhoff. That this work was done well can be seen from the fact that not one exhibitor of cheese failed to secure a diploma, while only two exhibitors of butter were found wanting. We believe that the work was done well and with good results, and we have this week received a notification from the Director-General of the Pan-American Exposition that Ontario has been awarded the Gold Medal for the best exhibit of export cheese. We have also received communications to the effect that the diplomas are in the hands of the engravers, and will be ready for sending out in three or four weeks.

I would ask Mr. Wenger, who was appointed on the committee in the interests of the butter-makers, and Mr. Steinhoff, who acted as judge of butter at one of the competitions at the Pan-American Exposition, to give some account of their observations while there.

The Chairman: I will now call upon Mr. Steinhoff to give the result of his observations at the Pan-American.

Mr. I. W. Steinhoff: I touched upon this subject last night, and I do not know that I have very much to say that would be beneficial to you. I might, however, tell you the method of judging the butter, and some points in connection therewith. The exhibit in October was a large one. There were 330 exhibits, from all over the United States and Canada. Of that 330 there were only sixteen from Canada. One of the things first noticed was the method of scoring. It was done by three judges, two Americans and one Canadian, Mr. Barber of Chicago, Mr. White of Boston, and myself. Butter was brought out of the refrigerator, each judge bored it, made his own score and handed in his card to a clerk or secretary, who made the average. We did not really know what the average

was or what the score was until it was averaged up by the secretary. You may know that we had to work pretty rapidly to score 330 factories in two days. One thing that struck me more than anything else was the variety of packages in which the butter was exhibited. They were all round packages, with the exception of the prints. There was not a square one in the American exhibit. They were all sizes, from 70 pounds to half-pound prints. I noticed a number of small wooden packages that were models of neatness. And I will make that observation wtih regard to all the American exhibits. They were put up neatly, and, as a rule, finished elegantly, and I think a delicate article like butter, that depends upon appearances, should be put up in the most attractive style. The small packages were about five pounds, in wooden packages, lined with paraffin paper and well finished, they were very uniform in quality, and they scored much higher than I expected they would. As a rule we do not expect a small package to hold flavor or keep as well as the large one. Even in prints they had a great variety of styles. Mr. White, of Boston, said you could not sell the square prints in his market, because, he said, they looked so much like bars of soap. There was one very stylish way of putting up prints, about four inches wide and five inches long, and then it was sub-divided, so that you could cut it in half pounds. All of them were of a nice shape, and very attractive in appearance. Let me mention one point in regard to the scoring of the butter. I have been asked with regard to the color. Some said they did not understand why some butter being very pale and other butter of the proper straw color, that both scored the same in color. I only scored down in color in cases where the butter was mottled, because different markets require different color. The Manchester market will take a butter as white as we ever make in Canada, or whiter, and some other markets will take a little color. Our Canadian market requires a little coloring, but they are taking a much milder color in butter than they did a few years ago, and I think we should educate our Canadian customers to use a milder flavored butter, because it often happens that where you are buying the output of a creamery you want part of it put up for the Canadian market and part packed for export. And you can use the same churning for both purposes. Supposing you are using one-eight ounce of color, that will not do for some markets. I am glad to see our Canadian market is taking a milder color. Butter was only scored down here in Woodstock on account of its being mottled, and the same thing applied at the Pan-American. There was some butter there that, if I was judging for export, I would score it down on the ground of color.

Mr. J. A. Ruddick : I would like to thank this committee on behalf of my own department, and on behalf of the cheese-makers in some of the other Provinces, for some very good work which they did for them in connection with this exhibit. Some of the other Provinces, particularly Prince Edward Island and Quebec, desired to exhibit at the Pan-American, and they laid the matter before our department at Ottawa ; but, as we had not made any arrangement for undertaking any work in connection with the exhibit, Mr. Hately very kindly offered to look after these exhibits for us, and it saved us a great deal of trouble. I am sure the work was done as well as it possibly could be done, and I would just like to thank the Association and this committee for the way in which they handled these exhibits for the other Provinces.

Mr. Harold Eagle : As a member of that committee I am sure the thanks of all of us are due to the Dominion Department of Agriculture, and especially to Mr. Ruddick, for the assitance given us ; and I also wish to thank the exhibitors for the magnificent way in which they responded.

ONE DAY CONVENTIONS.

You are aware there was a committee appointed from the floor of the House to receive applications from the cheese and butter men or dairy men to have local conventions held throughout the country during the month of February, and I will now give you a report of what has been done.

REPORT OF COMMITTEE ON LOCAL CONVENTIONS.

Your committee appointed at the opening session to receive and consider applications for Local One Day Meetings, with instructions to report to this session, beg to submit the following report:

1. Applications have been received for meetings from Lyons, Birnam, Henfryn, Ingersoll, Stayner, Chatham, Villa Nova, Molesworth, Harriston, Welland, Strathroy, Pine River, Attercliffe Station, Gas Line, Lawrence Station, Pinkerton.

2. We recommend that the applications be granted by holding meetings at the following places. It will be impossible to provide in every case that meetings be held at the places from which applications have been received, but one of the places mentioned will cover the ground: Aylmer, Arkona, Atwood, Ingersoll, Dunnville, Stayner, Wallaceburgh, Waterford, Harriston, Strathroy, Ripley, Pinkerton.

3. We should also recommend that meetings be held at the following places, providing committees of suitable and responsible parties make applications in due time, and will become responsible that all the local arrangements should be carried out: Brussels, Drayton, Vittoria, St. Marys, Mitchell, Owen Sound, Flesherton.

All of which is respectfully submitted.

J. N. PAGET, Chairman.
A. WENGER,
JAMES CONNOLLY.

Mr. G. C. Creelman: I was very pleased indeed to hear the report of this committee, to see what could be done to bring the patrons more closely in touch with the men who are manufacturing dairy products. I spoke of this for a few minutes last night, and I am very glad to have the oportunity this morning to go a little farther into the matter. We have at the present time in the Province of Ontario an organization known as the Farmers' Institute. We had some trouble in starting the Farmers' Institute in this Province, in getting farmers to take it up, and recognize it as their meeting, as you are having in bringing together the patrons of the factories. In the early days we had to go to the meetings and see a few people who were sufficiently interested to come out; but we realized that we were practically talking to empty benches. From that time the work has progressed, and now every one of you who are interested in the work in your own county know that to-day we have only to advertise an Institute meeting and send out competent men to address these meetings, and the meetings will be crowded, particularly in the evenings, to their utmost capacity. Last year there were present at our meetings 138,000 farmers, and while we must say that a great many of these people came out merely from curiosity, and partly to hear what the other fellows had to say, and partly to scoff, yet it is a hopeful sign that they will even come out for that reason. The proof of the pudding is that most of them get something that they take away, and while they do not always give the Farmers' Institutes credit for the good returns they get from the suggestions they hear at the meetings, nevertheless, they are better farmers for having attended the meetings, and whether the institute gets credit or not, it does not make any difference, the country is better for their having been there.

I feel that the Institute's work has got to the point now that we can, for the first time, do something in the way of a specialty. At first we had to put up a show. We had to have men on the Institute platform who were prepared not only to talk pretty good, but had to talk it so that it would be interesting, use illustrations and get people to come out and listen to them. Now that we had got them out, the next point was to

give them something a little more practical ; and the result is that he farmers now come to our Institute meetings, come for the practical discussions, and instead of our Institute speakers getting up and making long speeches, they get up, start the discussions and leave it to the men in the audience to say what they want to have discussed, and throw the meeting open. We have one man out this winter among the thirty-two who used to make a splendid address on "Foods and Feeding." He tells me this winter he simply puts up a chart, showing the composition of foods, and the way they may be combined to give the best results, and the farmers do the rest, and they go on and would talk the whole afternoon and in the night, if they were not called off for supper, so eager are they to get information along the line that will give them best results. The farmers are thinking as they never before thought. That brought us to the point where we can specialize. The audiences are assured, and now we want to give them what they want ; weed out generalities and give them what is practical. I took the matter up with the directors, and especially with your Secretary, and we came to the conclusion that in Western Ontario we can have special Dairymen's Institutes. We have got the machinery, and we have permanent officers in the different ridings who are already holding meetings, and it seems unnecessary to go to work to establish another organization when we have one working quite well. Why not use the machinery already set in motion, and direct that machinery to work along the dairy line interests? I hold myself in readiness, with the members of my staff, as far as our means will allow, to send men to your factories to co-operate with your instructors. (Applause.)

I do not know that I need to say anything further. We have got to that point where we are ready to co-operate with you. We cannot do it without your aid. Unless the butter-maker is prepared to take up this kind of thought I will tell you they are going to go behind in their business. I had the criticism made in Whitby. When something of that kind was suggested they said, "Mr. Creelman, it is all right for you to preach that kind of thing, we have all we can do now in the factory. We are only paid $35 or $40 a month for the work we are doing, and we work hard, and we have no time for fooling with the farmers." Now, I can only answer it in this way : that the maker is just like the school teacher, who says he has not got time to teach the rudiments of agriculture when he is taking too much of his time teaching other subjects I say if the cheese and butter makers have not got time to devote to the man who supplies the factory, and give him personal attention, they have no business in the factory, and they are going to lose ground, and will not be in the business long. The young man connected with the creamery or cheese factory who will study the wants of the patrons and look after the milk as it comes into the factory, and size it up in his own mind and see what is the trouble, and will then go over to the patron's farm and go through his stables and tell him what the trouble is, that is the man who is not going to get $30 or $40 a month, but he is going to get more money and is going to be in demand for every factory in the country. If there are men in this audience who are prepared to co-operate with us, and take up the educational campaign, we are prepared to meet them half way, and I believe we have the whole country with us. I believe the time is come when there is no shilly-shallying about this. I can see it, because I go all over the country, and we have a demand for such men. The farmers want to see how you spray, how you graft, and how you bud, and want it done before their eyes. The farmer must have things brought close to his eyes. Let us have free discussion on these matters and go right after them, go out into the factories and hold meetings, and then we will know more about the business.

Mr. Brown : That is one of the questions I have been endeavoring to put into practice in my factory for the past five years, and I have accomplished a little, but the last two years it has taken hold, and I have put in an application for a local meeting. I am glad to see that the Associations are going to have these meetings. So much has been said about depression of the markets of the world in connection with our dairy products, that we are going behind, etc. I do not believe it. I think it is because others are going ahead so fast, and we must improve in order to keep up with the procession, and in order to do so we must look after little details, and go to the stables where the

milk is produced, because there is the place where the finest quality of this product is produced, or destroyed. (Applause.)

The Chairman : I have now pleasure in introducing to you Mr. Eli Bourbeau, who will give you an address on the work of the cheese instructors in Québec. He is a very active man in his Province, and is carrying on a most magnificent work, and, as I have said, he has made cheese in England, and brought it to this country.

NOTES ON THE MEANS EMPLOYED BY THE QUEBEC DAIRYMEN'S ASSOCIATION TO TEACH ITS MEMBERS THE SCIENCE NECESSARY IN MAKING CHEESE AND BUTTER.

By Eli Bourbeau, St. Hyacinthe, Que.

The Quebec Dairymen's Association thought that the best means to be taken for the progress of dairying was to put within the reach of everyone interested in that industry the science that is necessary for the making of cheese and butter of first quality.

It has taken two ways to inculcate that science : the dairy school and the inspection of the factories.

Here is what it has done for the school : Even before its organization as an Association among its most active members it was admitted that the school was an absolute necessity. Messrs. Barnard and Chapais opened, in 1881, at St. Denis, Co. Kamouraska, the first cheese and butter factory in the eastern part of Quebec, and was at the same time favored with a bonus of $200 from the Department of Agriculture. It was the first dairy school established in North America.

The Dairymen's Association was organized in 1882. It opened a practical dairy school at St. Hyacinthe, which was operated until 1891. The same year the Association opened a practical dairy school at St. Hughes, and the next year it organized a travelling school. The same year the Association opened the present dairy school, which gives courses during the winter to apprentices and makers who are anxious to learn. In nine years 950 butter-makers and 1,319 cheese-makers, making a total of 2,269 scholars, followed the courses, making an average of 252 each year.

I will now tell what the Association has done regarding inspection : In 1883 its inspectors (Messrs. Jocelyn, Barre and Archombault) visited 30 factories ; in 1885 Mr. J. Painchaud, a former scholar of the St. Denis School, acted as official inspector for the Association; in 1887 Mr. Saul Cote, student of the same school, was named with Mr. Painchaud, and the next year (1888) Mr. J. A. McDonald was named with the two former, and they visited, during the season, 309 factories. In 1889 the Association began the organization of the syndicate. In 1890 three syndicates were organized, and the necessary funds were furnished by the Prime Minister of the Province of Quebec with the understanding that the Dairymen's Association would have the absolute control. In 1891 the syndicate was officially organized, according to rules made by the Association and approved by the Government. Ten syndicates were organized that year, the inspectors visited 242 factories and made 1,992 visits under the control of Mr. Saul Cote, general inspector of the syndicate. In 1892 Mr. Peter McFarlane was named general inspector of a syndicate numbering nineteen, with 307 factories, which received 1,838 visits. In 1893 the work of the organization of the syndicate was completed by the opening at the dairy school of special classes, theoretical and practical, for the candidates for inspectorships of syndicates, for which they are obliged to follow and pass a written and oral examination before a Board of Examiners appointed by the Association. The same year (1893) Mr. Cote was named General Inspector of syndicates which numbered twenty-seven. In 1894 your humble servant was named Assistant General Inspector. That year we organized twenty-eight syndicates and thirty-eight in 1895. In 1896 I became General Inspector

with Mr. J. A. Hamondon as an assistant, and Mr. J. D. Leclaire as General Inspector of the syndicate of butter factories, positions we have kept ever since.

Besides these three officers there are 42 inspectors of syndicates, and 5 who hold diplomas from the Association, are employed by the Department of Agriculture to visit factories that are not able to join the syndicate, which numbered last year 742, and the inspectors of the Association visited 840 factories, which makes a total of 1,582 out of about 2,000 factories that we have in Queebc.

Let me tell you now how these syndicates work. They were organized to obtain:

1st. Special attention for the reception of the milk, regarding the skimming, watering and taint.

2nd. Scrupulous attention to the keeping of the factory, regarding cleanliness.

3rd. The good condition and uniformity of the products.

4th. Keeping record of the reports that the factories are obliged to make each season to the Association.

The Province is divided into twenty divisions, and we can organize in each one or more syndicates of butter or cheese or both combined. Each syndicate cannot take more than thirty factories and not less than fifteen. Each inspector makes an average of seven visits to each factory each season, and receives a salary averaging $550, paid as follows: $300 by the Department of Agriculture, and $250 by the proprietors of the factories that join the syndicate.

The candidate inspector is admitted to the special courses, and has to pass the examination to obtain a diploma on the following conditions:

The candidate must notify the Secretary before the 1st of June that he intends to follow the special course. Then the Secretary gives orders to one of the General Inspectors to visit the factory in order to be sure of his capacity as a maker, and he must have been chief maker for not less than three years at a factory. He must also furnish certificate of the buyers that have purchased his cheese or butter during the last three years. If the candidate is found capable by the examination and the visit, he has a permit for one year. During that year he is frequently visited by the General Inspector, and if his work is considered good he gets a diploma.

At any time if the inspector does not give every satisfaction to the General Inspector for the Association the latter has the right to cancel the diploma given that inspector.

Every inspector is obliged, every three years, to follow a special course at the Dairy School.

I am sorry to say that although we are behind our friends in Ontario yet we are doing our duty for the improvement of the butter and cheese industry. One reason we are behind is that when the dairy industry began to spring up in Quebec it went rather too fast. Some years hundreds of factories were built, and with so many new makers we had to stay a little behind. It is ten years since we have secured this system of instruction that I claim is one of the best that can be organized, and since then we have made progress, and if we are not up to the mark with our friends in Ontario I hope we will be before long and that we will make just as good cheese. It does not do any harm to say so. Then years ago, when I first came to Ontario, I sold my cheese for 9 1-4 cents. I came to Brockville the next week and the market was 10 1-4 cents, and they sold their cheese for 10 1-4, making a difference of one cent. What is it to-day ? Your President can answer, because he knows the trade of our country. He is one of our buyers, and I may say we will keep him.

I must acknowledge there is a difference, too. I must say that we have cheese of the quality of the best made in Ontario, and the number of good cheese is increasing every year. What we have to contend with is small factories. When the gentlemen from Ontario speak of a factory they mean making eight or ten cheese a day. That is one of our good factories. I heard the remarks made by the Minister of Agriculture last night. I think they are the most solid remarks made by a practical man that I ever heard in my life, and if Ontario is still ahead of the industry we are pleased to know it. I must thank you for your sympathy in listening to me.

The Chairman: I think after Mr. Bourbeau's address you will agree with me that you are in very great danger of losing your prestige up here. With the system of instruction they have in the east, and the syndicates arranged as they have them, and the instructors educated as they have been, I feel that you need brushing up just a little bit to keep ahead.

MILK SUPPLIES—QUALITY, QUANTITY, ETC.

By J. A. Ruddick, Chief Dairy Division, Ottawa.

I understand I am merely to start discussion along this line. I realize, and have realized for a good many years, that this matter of securing a better quality of milk for the cheese and butter factories is one of the greatest problems we have in the dairy work.

It is a very difficult matter to get at the patrons whom we most desire to reach, and I am very glad to notice that you are making a move in the right direction in the way of holding smaller meetings throughout the country where you will have better opportunities of dealing with questions of that kind than you do at the larger meetings. I have had something to do with similar meetings of that kind through eastern Ontario during the present winter. We have had some of the most successful local meetings organized for just such purposes as you are arranging to hold during the next two or three months.

As this question presents itself to me there seem to be two classes of patrons who have to be considered. In the first place there are those who are in wilful negligence in regard to matters of handling milk, and who would be quite willing to take such precautions as were necessary if they only knew what was to be expected. It is not very hard to deal with that kind of man if you can get hold of him. Then there is the other class who are wholly indifferent, and who are not inclined to listen to reason or advice in any way, and these have to be treated in a somewhat different manner.

You have to convince a patron that it is in his own interest to furnish good milk, because by doing so you will enable the maker to produce a better article of cheese. You have to show that in as plain a manner as possible how the milk may be improved, and it is only by getting near the patrons in such a mode as has been proposed that we can convince them of the necessity for anything of this kind. There is just one point I want to emphasize, and then I will leave this matter for some one else to discuss. Ten or fifteen years ago there was a good deal said for the first time about the aeration of milk, and about that time a good many utensils were devised for that purpose, and cheese factories were especially advised to depend on the aeration of their milk rather than cooling it by any other means. I believe a good many of us were making a mistake in that direction in advising the patrons too strongly on that point. I am free to admit I made that mistake myself. I believe that has had a great deal to do with lowering the quality of cheese during the past few years. I think it was a mistake to advocate the aeration of milk and to depend on that alone to preserve the best condition for cheese making. I believe the milk should be cooled in hot weather. The aeration of milk itself does not prevent the milk from turning sour except in so far as it lowers the temperature. The difficulty is that in hot weather, when we need the cooling most, aeration has little effect. It depends upon the difference between the temperature of the air and the temperature of the milk, and when the air is warm there is very little cooling effected, and this is the weak point in depending upon aeration alone. I will say milk which is aerated without any change of temperature will sour quicker than if it was never aerated at all, because allowing it to go into the air in that thin stream allows the organisms that produce lactic acid and sourness to get into the milk.

Then there is another point in connection with aeration, that a great deal of milk is injured in flavor by being aerated in a place where the atmosphere is not pure or free from dust. That kind of areation is an injury to the mlik rather than a benefit, and it is a very common practice to areate the milk in the barnyard or in the yard where the cows are milked. The milk should be removed from any such surroundings before areation takes place. During hot weather it would improve the milk for cheese-making purposes very much to have the temperature reduced by some other means—icing cans or using any means which will be sufficient to reduce the temperature. From a cheese-maker's standpoint I would say, I would like to have the milk arrive at the factory every day during the summer in sweet enough condition to allow you to use a good lactic acid starter. I believe that would be a great help to the cheese makers in producing a better and more uniform quality of cheese. A good deal has been said against the use of a starter. We never should talk against the use of a starter as a principle. No man ever made cheese without a starter in some form or other. It either gets there by chance or he puts it in. We must control its fermentation to some extent; you cannot make cheese without it, and it is nonsense to talk against a starter, as a principle. I am quite free to admit many use a starter that does not answer.

Last spring, at Ottawa, I had the privilege of preparing for the cheese makers and factory owners a bulletin entitled "Milk for Cheese Factories." This bulletin is prepared for popular reading, so that it may be distributed among the patrons, and we are glad to furnish every factory with a sufficient number to supply one to each patron. We also have one prepared on the "Milk for Creameries," and we send this out to any butter maker or owner of a factory who applies to the Secretary of Agriculture. We distributed 25,000 last year. We have a large number reprinted, and are prepared to supply these in any number that may be required.

Mr. T. B. Millar : Is it not a fact that the average patron, when he cools his milk, fails to aerate it ?

Mr. Ruddick : I would not advocate that practice. I do think I would rather have the milk cooled during the hot weather than aerated and not cooled.

Mr. Millar : We find in this western country that if you cool your milk without aerating it you have the worst kind of milk to make cheese. I would certainly advocate cooling the milk after aerating. At the same time, we think cooling the milk without aerating makes it difficult to make first-class cheese. While I admit we must have some lactic acid to make cheese, I say a starter as it is used to-day has more to do with making of poor cheese than anything else. (Applause.) The over-ripening of milk at the factory, and using a starter that was not suitable, have done our cheese industry more injury than anything else. If we could educate our people to produce good milk, and air and cool it in hot weather, it would be better. We want it aired and cooled at the same time, and if they would do that in nine cases out of ten we would not want any lactic acid starter. Until we get some better way of making a starter and keeping it I say by all means do not use it. I find the maker who uses the most starter makes the poorest cheese. I can give you an instance where a maker was not making good cheese, and we went and threw his starter out and we said, "Don't use that any more this season," and from that time he made good cheese.

Mr. Ruddick : I agree with what Mr. Millar has said, but it does not change my view as to what I say about starters. The starters he refers to are not starters. The cheese maker who does not know any better than to use a starter which will make bad cheese should not be allowed to make cheese. The use of starter is very much abused, and I believe it is quite true that a great deal of bad cheese is made in that way, and we must correct the use of starter. Because a starter is a necessary thing we must have this fermentation which the starter produces, and it is better to control the fermentation by having these pure-flavored starters. I do not see any difficulty in makers preparing a new starter and propagating it from day to day.

Mr. MacFarlane : Can you give us any information so that we can get the milk and it will air itself ?

A Member: I have had the same trouble that Mr. Millar has spoken of in reference to cooling and airing. I admit that cooling and airing are all right. The cooling is all right and very necessary, provided you get the air in along with it, but many of the farmers get the milk in a can and set it in a tub of ice water and that is the end of it, and the result of the whole thing is that the cream rises quickly and forms a scum over the top, so that the animal odors are imprisoned in that can of milk, and you have a combination of flavors that is far inferior to the simple animal odor that is left if it was aired and cooled. I have found that that is the very worst kind of milk to be manufactured into cheese or butter, because it is simply an impossibility after that odor has been imprisoned in the milk to get it out by any method that I have discovered. (Applause.)

Mr. Ruddick: I do not want to be misunderstod by anyone present, and that you should think that I would advocate cooling of the milk without aeration. I believe in the principle of aeration thoroughly, but I would advocate the cooling of the milk with aeration. That is what I meant to say if I did not make myself understood thoroughly I will do so now. If the patrons are not doing that there is no reason why we should not ask them to do so. There is no doubt in my mind that the aeration of the milk followed by cooling would have a beneficial effect, but in hot weather when you require to get the milk at a low temperature aeration will not cool it. Speaking of using starters, Dr. McConnell and myself, at Kingston, made some experiments in reference to the organism which produces that reddish color in cheese. We had cultures of this particular organism, and we were able to produce that effect on the cheese by these cultures, and by the use of a good starter we have been able to overcome all bad flavors in cheese.

A Member: I would be very much in favor of getting the milk cooled and well aerated, and using a starter. I think the milk should be ripened at the factory and kept cool.

Mr. Barr: I quite agree with what Mr. Millar says about starters. I firmly believe that the use of a starter has caused more trouble and made more bad cheese than any one thing in Ontario to-day, that is, the misuse of it. At the same time we know through the months of June, July and August, when we are making the most cheese, we are getting the kind of milk that is very hard to make good cheese out of. I think the only reason why we cannot make a good cheese out of this milk is because it comes to the factory over ripe. I have been an advocate of cooling the milk, along with aeration, for a number of years. I do not feel like getting on the platform and advocating it strongly because I knew a great many of the makers did not agree with me. I think we have come to the point when we have got to have milk in a better condition with regard to lactic acid or ripening of the milk when we get it to the factory. We should make our very finest cheese in June, July and August, and we find we cannot make this silky cheese for the simple reason that we get the milk in such a condition that it works too fast, and we cannot handle it. We should tell the patrons that they will have to deliver their milk in a sweeter condition, and then I do not think you will require to use a starter.. At every factory I have gone into this summer that was the one condition that was wrong and almost the only one. We find the flavors the biggest trouble with the cheese, and when we make them from over-ripe milk, and the makers do not know how to handle that over-ripened milk to the best advantage. If we could get the milk to the factory in a sweet condition I do not think there would be any trouble in educating the makers to produce good cheese. We must get our milk to the factory sweeter, before we will make a large number of cheese as silky and good as we should. (Applause.)

Mr. Steinhoff: Following the statement of Prof. Harrison along the line of investigation he has made, I think there is the one point we ought to take up, and that the influence of this Association ought to go in the direction of the improvement in the cleansing or washing of the cans. Prof. Harrison made it very clear that this bitter flavor coming in the can after going through the ordinary process of washing, is not cleansed of it. We ought to be able to do something in the way of

improving in that particular matter. One of the men who applied for one of these small meetings said to me that one of the reasons for wanting it was the practice they had of handling the cans in that neighborhood. They do not return the whey in the cans, but the cans are taken home by the milk drawer not washed, are kept by him all day, and then taken in the morning. He distributes his cans as he goes down the line. They are then washed and the milk put into the cans as soon as he returns. These cans cannot be thoroughly cleansed if this bacteria is so hard to get out of the cans. I submit it is a very important matter, and we should adopt some means of having them specially cleansed.

Mr. Brown : There is one point I would like to speak of. I would like to ask Mr. Ruddick if he has found any definite information with regard to what is known as "goose flavor" in milk. It is a very common thing, and one of the worst flavors makers have to contend with. I have my own opinion in regard to it, that it is caused from the cows having access to pools in their pasture fields that have been scooped out for the water to settle into instead of furnishing the cows with good fresh water. My reason for thinking so is that in our section I meet with it after an excessively dry time.

Prof. Ruddick : I am not acquainted with this flavor. The water that a cow drinks having any effect upon the milk is a disputed point. I think the contamination is very often in a direct way. The cow tramps into these places and she carries off on her legs and udder and tail and flanks particles of mud, which dry up, and at the time of milking these small particles of mud fall directly into the milk pail. There is a direct infection in that way, and it is one of the most serious things. Of course, scientific men say it is an impossibility for any living organism to pass through the cow with the water she drinks. Of course if the water is impure the health of the cow will be affected, and the milk will be affected in that way.

Mr. Brown : I think it is an exaggeration of stable flavor.

A Member : I was in England last summer, and found there that they do not cool the milk, and they do not air it. I am not saying it is bad, I am just telling you what they are doing, and although they do not cool or air the milk they have the best quality of milk. Why ? Because the man that milks the cow takes every precaution. The udder is thoroughly brushed, the milk pails are washed with cold water, and then with warm water, and then passed through steam. The vat in which the milk is put in the factory is also washed with cold water and warm water and then passed through steam, and I think if every patron would take these precautions it would not be necessary to discuss airing and cooling. (Applause.)

Mr. Sullivan : I have attended many of these meetings. I am not a cheese maker. I am a salesman, and I am glad to see the turn things have taken here today. Do you know the speakers generally have a habit of dinning at the farmers for not sending better milk to the factory. I have always contended that was useless as very few farmers attend these conventions. Hundreds and thousands of farmers do not know anything about these conventions unless they read the reports in the papers, and I always thought that these small meetings should be the place where these matters should be discussed, so that the farmers would know what was really necessary. Talking about cooling the milk, one-half the farmers never cool their milk and never air their milk. They feel proud to think they have got the cows milked when the milkman comes along to receive it. (Applause.) The drawer has to be at the first stand at six, and you know how troublesome it is for a farmer to get up and milk eight or ten cows by that time. I have always advocated that the cheese maker is the man who knows what is wanted. Knowing every patron who sends bad milk he should send it back. Half the cans are not fit to put milk into simply because the tin is all worn off them and they are only iron; and what will give a worse flavor to milk than that ? I have always contended that milk sent to a factory that is not in proper shape should be sent back, even if it is owned by a man who keeps twenty cows. If his milk is not fit for making cheese what is the use of dumping the milk into a vat and spoiling the whole lot ? It is running the risk

of spoiling that batch of cheese. But a maker does not like to send it back for fear the patron would be offended. Every cheese maker should be an expert, and should go around and see every patron once or twice in the year and tell them what is wanted. It has been stated here that our cheese is going back. I do not believe it. I believe we are making a better cheese to-day than ever we made, but I believe the competition is greater, and there is no doubt we have to exert ourselves and make a better article. What did we see here yesterday at the exhibition of cheese. One man sent cheese that the judges said if he had ever tasted it he would never have sent it here. Why should a cheese maker send cheese here that had a bad flavor ? We have experts going around the country. A man comes to our place and buys the cheese. He has never seen it before he goes out to look at it. He says it is all right and takes it. Maybe next time some other buyer comes and he says, "Something wrong here." "Well, what seems to be the matter with it ?" "These cheese have not got the natural quality," and he puts them to one side. Then the salesman says, "Take what are right and leave what are not right." Then the buyer says, "They all have the same trouble; we cannot take them unless you make a reduction." Finally he gets the cheese-maker persuaded that he will lose something on the cheese, and the poor cheese-maker has got to suffer and make up the deficiency. I claim that is wrong. I claim every cheese-maker ought to know just as well as that expert, and if he cannot tell what is wrong with them then he has no right to be in the factory. They have these dairy schools to go to. They can spend a month or two months there to the very best advantage. A man who has been thirteen or fourteen years in one factory could learn something in any one of our dairy schools.

We have experienced more trouble this year with cheese than any other year, because a great many factories were not prepared for the hot weather. Cheese were selling at 9 1-2 and 9 3-4, and they offered us 8 1-4 week after week for September and October cheese. Talk about compelling salesmen to sell on the board and nowhere else. There were all these two months cheese, and I do not suppose a thousand cheese were sold on the board ; but they got the man in the fence corners to buy the cheese.

Mr. Smith : Do you suppose it is necessary to cool the morning's milk ?

Mr. Ruddick : When speaking of cooling I referred to the evening's milk. The morning's milk should be aerated just the same as the evening's milk, and that aeration will cool the the morning's milk sufficiently for all purposes.

A Member : What system would you recommend ?

Mr. Ruddick : Any system. Fully expose the milk in a pure atmosphere in a spray or film or by pumping air through it.

A Member : Do you approve of cold water for cooling the milk ?

Mr. Ruddick : Certainly ; if I cooled it that is what I would use. If you had ice convenient you could use a small quantity.

A Member : That has been condemned in our section. It is claimed that the cold water cools the milk very suddenly, and that you retain any germ in it, and that it develops again after it is heated up.

Mr. Ruddick : We advocate the airing and cooling of the milk during hot weather.

Mr. Bell : What temperature would you advocate cooling the milk to in hot weather ?

Mr. Ruddick : Milk will keep better at 70 degrees under certain conditions than it will at other times at 65 degrees. You have simply to be guided by the conditions.

Mr. Bell : I find that at 70 degrees it keeps very well, and that seems to me a very good temperature.

Mr. Ruddick : What are your views with regard to cooling the milk ?

Mr. Bell : For ordinary work in the factory, keeping milk over night, I advise cooling and airing at a temperature of 70 degrees. If the vessels are cleaned properly I find that temperature quite low enough. For keeping a longer period I would cool it at 60 degrees.

A. F. MacLaren, M.P.: When I was judging in Chicago in 1893 I could have told 90 per cent. of the cheese that came from Canada if I had been blindfolded, because they were so much superior to the United States cheese, but at the Pan-American I find they were right up alongside of us, showing the very rapid progress they have made in the last eight years. Wisconsin cheese was in a very bad shape in Chicago, but at the Pan-American they had some of the finest cheese there. And the same with the Michigan cheese. At Chicago I never saw so much trash in my life as the cheese that came from Michigan, but they have improved very much, and the New York cheese was also very fine. I want to warn the Canadians that if they want to keep to the front they must make progress and not let these people pass us. They are making desperate efforts to get our trade. We must improve the quality of our milk and cheese and to do that we must get to work.

A PRACTICAL CHEESE EXAMINATION.

The Chairman: We will now pass around this cheese, the two kinds that came from Guelph. The one was put into cold storage immediately after being made, and the other was kept for three weeks, and then put in cold storage, and you can decide for yourself as to what effect cold storage has on cheese that is ripened at a cold temperature as advocated by some of the professors.

Mr. R. M. Ballantyne: It has surprised me that these cheese are of a meaty texture. I believed cheese put into cold storage immediately from the hoop would not ripen, and that they would stay curdy and would not be anything else until taken out and cured at a high temperature. I did not think it would be possible they would become good marketable cheese. These cheese, in my opinion, are not exactly like our summer cheese. They were made on the 26th day of August when the summer days are past, and when summer conditions do not prevail. I will read you a letter that I received from Professor Dean. He says: "These two cheese were made on August 26th last. The A cheese was put directly into cold storage from the hoops, and the D cheese at the end of three weeks. They have been in boxes for some time. They are not selected, but are the first two we struck when looking for the cheese to send to your convention. I trust that your members will enjoy them and profit by their examination. Should be glad to have any criticisms your experts care to make."

Now the cheese that were sent to Montreal were made on the 8th of July, six weeks before these cheese were made, that is, during the summer season when we get milk that is not so rich in fat, and when we have higher temperature, and when we have ordinary summer conditions.

The cheese sent to Montreal showed a much more marked difference between these put at once into the cold storage and those kept two or three weeks on the shelf. I feel that we have now reached the point when cheese has to be cured in cold storage, when the days of curing cheese at summer temperature in an ordinary curing room are passed.

Mr. T. B. Millar: When you say cold storage do you mean a temperature below 60 degrees or below 40 degrees?

Mr. Ballantyne: My own feeling about it is that a temperature low enough to control the conditions of the atmosphere is sufficient. I would say a temperature of probably 40 degrees was better than a temperature of 60 degrees for this reason, that at a temperature of 40 we do not have evaporation, and we keep the moisture in the cheese, and because the cheese kept cooler do not develop the bitter flavor we were afraid they would develop. The cheese held at the temperature of 65 degrees lost their nice mellow character, and became dry, became such cheese as we generally use in winter time from being held in cold storage during the summer. We hold

great quantities in cold storage and take them out in the winter time, and we expect they will be dry, so we expect to sell them for much less per hundred weight than September cheese. You will notice these cheese have none of that dry character, and the cheese made the 8th day of July, put immediately into cold storage and shipped to Montreal in the fall of the year, had none of that dry character, and were as nice cheese as the September cheese we had in our place.

A Member: How long were they held in cold storage?

Mr. Ballantyne: I think about three months.

Mr. Millar: That will be one of our troubles, the patrons will not want to have them held so long.

Mr. Ballantyne: We are making cheese in six months to be consumed in twelve months, so that necessarily some person must speculate on these cheese. A large quantity of the early make is put into cold storage. I do not believe the trade would adapt itself to the change if you all do it, but if you do it gradually the trade will adapt itself to it. There is not much difference in flavor in these cheese that are being passed around, but there is a marked difference in texture. The cheese put into cold storage at once have more moisture than the cheese put in at the end of three weeks and the difference is in the moisture. The difference we found at Montreal was both a difference in moisture and a difference in flavor. There was a very marked difference in texture.

Mr. Steinhoff: Might not that difference be due to the consistency of the cheese when made?

Mr. Ballantyne: These cheese that are being passed around to you were out of the same vat; both made from the same curd. The cheese we had at Montreal were exactly the same way. They were made from exactly the same curd, cheese from the same vat and same curd, so that they are not in any sense different cheese.

Mr. Millar: What is your opinion of the cheese held one week?

Mr. Ballantyne: Cheese one week in the curing room and then put into cold storage were very slightly different from the cheese put in immediately from the the end of one week and those put immediately into cold storage. The cheese that are put into cold storage immediately do, at some time of their existence, lose the surplus moisture of the outside, so that there is not much difference in that respect. After the moisture that the bandage holds is evaporated the cheese itself begins to evaporate, so that I do not believe a temperature of 65 degrees for one week would make much difference, but when you go beyond that period it does make considerable. The cheese held showed a marked difference.

Mr. Millar: There was a marked difference between cheese put in immediately and the cheese put in at the end of two weeks and the end of three weeks.

Mr. Steinhoff: There was no difference between cheese put in at the end of the week and those put immediately from the hoop.

Mr. Ballantyne: You could not see any difference?

Mr. Millar: That might be due to something in the cheese.

Mr. Ballantyne: I would not judge so, seeing that they were both out of the same curd. These cheese that were put from the hoop into cold storage were judged by experts in Montreal. About half of the men who scored these cheese were inclined to think the cheese put immediately into cold storage had too much moisture as compared with what they generally understood to be the proper consistency of cheese. The people generally like a moist cheese, and that is really the position of the consuming public, but the idea is this, that a buyer who buys a moist cheese buys a cheese that will go wrong in flavor early, because the moisture makes conditions favorable to the growth of bacteria, not because they are too moist for eating, but because they are too moist to keep.

Mr. Millar: Cured at too high a temperature.

Mr. Ballantyne: These same men said the cheese put in at the end of three weeks were too dry.

Mr Millar: I tried an experiment along this line myself. I took shipments

hoops. It was exceedingly difficult to make any distinction between cheese put in at of cheese two weeks old, made in the first half of July, put them in store for a week or ten days, and then shipped them out, and I had very good reports of them. I know very well that if I had kept them in the factory I would have had very bad reports, because it was excessively hot weather.

Mr. Ballantyne: In the east we have conditions that you do not have here at all. Instead of the buyers going to the factory and inspecting the cheese they buy it, and it is shipped to Montreal immediately after purchase. The salesman says, I have so many cheese on the shelves, and the buyer, anxious to buy them, buys all he can get. In many cases we buy all the cheese in the factory, and as soon as they are bought they are shipped to Montreal, where they do not wait for the buyers to inspect them. We get cheese in there that you cannot break down under the thumb. We still pass these cheese on and put them in cold storage, and they come out and give the best satisfaction. I always believed before that you had to cure the cheese on the shelves if we were to have good cheese when cured, but my judgment on that point is entirely changed. I believe that cheese have to be got away from the factory green and put into the cold storage.

The Chairman: I believe in cold storage, and I wish we had more of it through the country.

Mr. Steinhoff: The makers in this district say that they will have a great saving, because in the spring they will have cold storage right in the curing room, and they will not need to burn so much wood.

Mr. Ballantyne: The same thing exists in the spring as in the summer. When you bore cheese, you will find the middle of the cheese at a lower temperature than the temperature of the room, so that the temperature must decline to the point that keeps the cheese at a lower temperature.

DEVELOPING THE CANADIAN BACON INDUSTRY.

By F. W. Hodson, Dominion Live Stock Commissioner, Ottawa.

I am very glad to see the ladies present, as I think they have a great deal to do with this question of butter and cheese making. I think it is the duty of every man who owns a cow, and every woman, and especially those who have several, and whose livelihood in part or altogether depends upon the product of these cows, to be at meetings of this sort, none of us can afford to be absent. A great many persons say they cannot afford the time and expense. I am one of those who believe that we cannot afford to stay away. We should be here to listen and pick up crumbs of information, and take them home with us, and digest them thoroughly and apply them to our business. It is not enough for us to come here and listen and criticize, and you know that we as farmers are prone to criticize. We have come to the Farmers' Institute meetings, or meetings of dairymen, or fruit-growers' meetings, and we listen to what the speaker has to say, and we wonder who he is and what he knows about the business, and whether what he says has been gotten out of books, or from experience, and we talk about men as being book-farmers, and farming according to book. That kind of criticism is passing away, and we want to dismiss that kind of thing from our minds altogether. We want to stop criticizing the speaker and learn all we can from each other. Pick up these crumbs; do not swallow them whole, but digest them. Weigh them carefully and when you get home think about them, and talk to your neighbors about them, and talk to your wives and children about them. Put them into practise and try them, and apply those that are applicable to your own business. You know there are certain dairy practices that may be good for you and not good for someone else. There may be breeds of cattle that will suit your farm exactly, and that may not suit some other farm as

well. Think about these things, and take them into your consideration. Do not be prejudiced agains things because you do not know all about them yourself.

I consider that not only men who are dairymen and farmers should attend these meetings, but citizens of towns and villages should attend them also. Why? Simply to learn all they can about what the farmer requires. We do not realize as we should that our store-keepers and professional men, lawyers and doctors and even ministers are dependent on the prosperity of the farmers. If there are not any ministers here to-day there should be, for every man has an interest in the growth of agriculture and in the education of the agricultural class, because on them the wealth of the country depends. The newspaper man, the doctor, the merchant, the lawyer and the storekeeper is prosperous if the farmer is prosperous. Why was it that a few years ago our wholesale houses failed? Why was it that our country merchants were pushed to the wall, and everybody felt the depression? It was because the farmers were not prosperous; were not as prosperous as they should be; old grain-growing days were passing away. We did not know as much about dairying and stock-raising as we should. Perhaps that would not apply as much to this district as to some others, but a great depression came over agriculture, because a change was coming in, and all classes of men, professional and otherwise, felt it. It was a useful lesson to them, that they might know that on the success of agriculture depended the success of all classes of the community. This is an actual truth, and let us realize it, and let us publish it, and let us rub it into the professional men and merchants, so that they will take an interest in agriculture and the education of the agricultural classes. The well-being of the agricultural classes is the greatest safe-guard to this country. That is the one thing we require above all others, and farmers themselves have it, in a measure, in their own hands. We have the right to demand that we should receive the co-operation and help of the rest of the community.

I said I was glad to be here, because I have a chance to pick up information, because I am not only a Government official, but I also am a dairyman, and I am a farmer and have been all my life. I am the son of a farmer, and have been for a long time a dairyman, and for that reason I am glad to be here. I will tell you why I came here. In the first place I came to bring apologies. I do not like to make apologies; that is one of the things I think a man ought not to do from a public platform, but in this case I cannot help myself. At the eleventh hour, just before dinner on Monday, I was told to come before this meeting and express the regrets of the Honorable Sydney Fisher, Minister of Agriculture for the Dominion of Canada, who is our Farmer Minister of Agriculture. He himself is a successful farmer and a successful dairyman; a man who has fed his own cattle and fed them successfully, his dairy products gain the highest prices at Montreal. He takes a very great interest in associations of this sort, so great an interest in fact that he attended the late Convention for a whole week in Guelph, this year and also in previous years. He was present at the Eastern Dairymen's Association. He was present at the meeting held in Amherst, Nova Scotia, and he is a useful man at these meetings, because he always does all he can to make the meetings he attends a success. But on this occasion he could not be present, and he regretted it very much. Business in connection with the Cabinet, and in connection with the trade in South Africa, prevented him from coming here. A very large quantity of agricultural products are being shipped from St. Johns to Africa, and Professor Robertson is required there at this time, else he would have been here.

I think I can do nothing better than take up the thread of your discussion; beginning with the words dropped by Mr. Pattullo, when he said that he would like to see central curing stations built and the curing rooms at the factories equipped as audience halls. This is the keynote to success in dairying; to greater success than we have had before. We must have these meetings, and they must be made as educational as possible. Patrons must discuss at these meetings questions of importance. Do not talk about a lot of things and then not do them, or say anything more about them until you come back to the next gathering. I think you can have a monthly meeting in every cheese factory where you can discuss, with the patrons, those things which come before

the maker during the month. You all know that the farmers want to do the best they can. I want to manage my dairy herd as well as I can ; I want to make every dollar out of it that I can, and if it is going to hurt the product through anything that I am doing then I do not want to do it. The makers do no get close enough to the patrons. Why don't they ? I believe the makers are very frequently good men, and they mean to do right, they are public spirtied men, but they do not seem to have the time to meet their patrons as frequently as they should, and some of them are afraid to call a spade a spade, and an axe an axe. It does not do to be rude, but at the same time we must have the courage of our convictions, and state actual facts without varnishing them. Not only should the butter-maker and cheese-maker do their work exceptionally well, but they should be centres of information from which the patrons can draw inspiration. Every cheese-maker should try to have the best informed lot of patrons he can get. If a bulletin comes out he should get it and scatter it among his people. The education of the patrons is one of the chief works of every Institute Secretary, and of every cheese-maker ; he should be a centre of information.

I do not believe dairying can be made as profitable as it should be unless you work up the by-products. Denmark is working them up, and Ireland is working them up through their bacon hog, and their poultry, and their honey. I can only deal with one of these things, and what I say in connection with one department will apply to all others, I will take up the case of the bacon hog in connection with dairying.

How are we going to produce the best sort of bacon in this country ? Simply by informing our patrons of the requirements of the market. How are we going to get that information to the patrons ? That has got to come through the Farmers' Institute lectures and the makers in cheese factories and in creameries. How are they going to get that information to the patrons ? Simply by learning it themselves. They must learn the requirements of the market, and if it is Wiltshire sides that are wanted in the old country, or a particular class of hog, then the makers of the cheese factories must be well informed. He must know the requirements of the market. and he must know the kind of pig that will produce that bacon. How is he going to learn that ? The Minister of Agriculture for this Province holds an illustrative Farmers' Institute meeting at Guelph annually, known as the Provincial Winter Fair, and I believe every maker in this country should attend, whether man or woman. A number of you gentlemen do go to that Fair, but some of you do not, and I will tell you in a few words what is done there. In the pig department, and the same in every other department, the cleverest men in the bacon industry are brought there to judge the pigs alive. They judge them before the audience, and after the judging is done these men are asked to give their reasons for awarding the prizes, and after that is done and the discussion is finished, these animals are killed and dressed and judged again by the bacon curers, and they are again asked to tell the audience why they award the prizes as they did. This work is not all perfectly done, but is being done better and better each year, and a great many people are going there to see and hear, and I think all the cheese-makers should come to that meeting, and, further, I think they should go to the packing house and see the sorting done, and follow the animal through the slaughter and into the salt, and learn all the facts connected with the business, and communicate these lessons to their patrons, so that they may be well skilled in raising bacon hogs. If they would do that our bacon industry would improve more rapidly.

How are these men going to afford to do this ? I do not think there is a cheese factory or creamery in this country that cannot afford to send their maker to learn these lessons. They can afford to pay their expenses and wages. You should treat these men liberally. Take any great commercial house in this country, and you will find they do all they can to develop their clerks. I believe there are men who do not believe in this sort of doctrine, but I know it is the right way; I know it is the only way we can put Canadian products in the high place they ought to occupy in the markets of the world. In order to get bacon of the highest quality, it is necessary to have pigs of the right quality, and to feed them properly. We have got to have pigs bred properly and fed properly, these two things have to go hand in hand. You can spoil the best pig on

earth by improper feeding, but you cannot make a pig that is wrong into the right kind of a pig by any kind of feeding.

A good many people believe the only way they can produce the right kind of a pig is by crossing and intercrossing the breed. That is all wrong. Get one sort and stick to it. Do not breed Berkshire this year and Yorkshire next year and Tamworths next year, but take one breed and perfect it. You can get as good bacon in that way as you can by crossing and intercrossing ; the same way wtih your dairy herd ; if you are breeding Holsteins, continue in that line ; it is not necessary for you to breed from pure bred females. If you buy pure bred males of the right type you will be successful and you can model your animals almost as you please; you can make them what you will if you use the right sort of intelligence.

I have been asked by some to describe the right sort of pig. I do not think it is necessary for me to do this to-day. I think you have heard of the right sort of pig a good many times ; if you have not you will soon learn by attending some of the Farmers' Institute meetings or by going to the slaughter house at Ingersoll or elsewhere. It costs the farmer no more to produce the right sort of pig than it does to produce the wrong sort. I have heard it said time and again that the big fat pig is more cheaply produced than the bacon hog. That is not true. Experiments have been made that prove that the pig the pork-packers demand can be produced just as cheaply as any other. The right sort of pig will produce as much bacon from the food consumed as any other. If we persist in feeding these big fat fellows we will come in competiton with the American pork. In the United States pork can be produced more cheaply than it can be produced here, and if we go into competition with the Americans we will have to go out of the business, because we cannot produce fat pork as cheaply as they can. The custom over there is to put one steer in a corn field, and with each steer turn in four pigs, and the pigs follow the steer and pick up the corn that the steer knocks down. That kind of a pig will not produce the sort of bacon that make the Wiltshire sides, and Canada. Denmark, Ireland and a portion of England have that trade largely to themselves.

When I was in the old country this summer I saw a great deal of bacon that our product comes into competition with. Our bacon will sell for more a pound than the American, but if we persist in producing fat pork we will come in competition with the American, and also with the Russian. We are sending an exceedingly good product to the old country, and our bacon has a good name there, but at the present time we have come up against a serious question ; our farmers are selling their pigs too light and too thin ; a great many pigs being put on the market before they are finished. Last week eighty per cent. of the pigs received by one of our largest packers were numbered two and three bacon, and only 20 per cent. numbered one, simply because grain is high and the farmers are selling their grain and pigs, and making a little more money out of them in that way. The packers are losing about $1 a head on these pigs. Who is going to lose this money by and by ? It will come back on us ; I think it a very great mistake for farmers to put a product on the market to be exported or to be sold on their own market that is not of the highest grade ; we should put on the market the best class of goods in the best possible way.

That brings me to another point, and that is this : that we as farmers wish to obtain the highest price from the drovers for our pigs and for products that we have to sell. When we deliver the goods our responsibility does not end there ; we must go further than that. It is very much to our interest as producers that our products should be put on the market in the best possible condition. We cannot afford to let drovers and others abuse our goods; we must insist that they are landed in the old country in the best conditon, because this means dollars and cents to us. We do not realize the effect of this as we should; I did not realize it till I went to the old country last year. Another thing the farmers should consider, and that is that the goods must be put on the market in an attractive way, because that means a greater demand for the goods and a growing market. If we put our goods on the market in a sloppy way, it does not matter how good they were originally, it will mean a loss of trade. A growing demand means dollars and cents to the farmers, and if the demand is not good it means a loss to both the

buyer and seller, and if the buyer makes a loss to-day we have to make that up by and by, or they have to go out of business, and that means a loss to the trade. I think it should be the ambition of every butter and cheese maker to see that only the best butter and cheese comes from his district, and also that the best pork and the best fowls and other products that come as a by product from the dairy. It should be your ambition to see that these things are the best that can be produced.

What is the outlook for this bacon trade. If we produce the right sort of pig, we are bound to increase the trade, I believe we are rapidly gaining on the Danish and the Irish. At the present time they are getting the highest prices. They are going to no end of trouble to produce the right sort of pig. Our dairymen must produce these pigs, because you cannot get as good bacon in any other way as from the by-products from the creameries and cheese factories. I think the outlook is very good. In the United States and Canada pork is high, and I believe for the next two or three years we will see the prices of the right sort of pigs high. The outlook for the farmer is good, providing we supply the right sort of stuff ; but if we continue to put on the market unfinished animals we are going to see a drop. Packers are being punished to-day, and it will come back on us if we are not careful.

Mr. Ballantyne made a very fitting remark when he said: "This refrigerator car service we are getting is a good thing. It is a step in the right direction." It is not all we require; it has not been followed out quite far enough. We have not as dairymen followed it out as far as we should, because in starting a car from London to go to Montreal, before it gets to Montreal the ice is out. Mr. Ballantyne said we should have ice houses here and there along the line, so that these cars can be replenishd from time to time. This is one of the details. I hope that remark dropped by Mr. Ballantyne will be taken up by this Association and followed out, and put into practice.

There is another difficulty. These cars are filled with ice from the top, and the top doors are not locked, and in passing through the country the trains are side-tracked to let express trains by. I have seen agents at stations, and other men, climb on the top of the cars and take out pails of ice, and let in the warm air. It is a small matter, but it is one of the little flaws that injure the service much.

When I was in England last year, I noticed a great deal of Canadian goods being unloaded on the wharf, and I noticed butter and cheese on the wharfs far too long; some steps should be taken by your Association to bring this to the attention of the persons that buy on the other side. It is a cause in which you are interested. We may take good care of the goods here, but it is possible for them to be spoilt on the other side. But I am told there is not so much danger of spoiling cheese in this way, where they are properly cured. Another point that came up yesterday that I would like you to consider, is that of the time to hold your Convention. At this date each year there are Farmers' Institute meetings held all over the country. Last year there were some 800 Farmers' Institute meetings held, and 138,000 people attended them. Men are engaged as lecturers who are successful in the work. These men are attending these meetings now, and they cannot be at your Convention. Your dairy work ought to be brought into closer touch with the Farmers' Institute work than it is. The only way that this can be done is for this convention to be held some time when the Farmers' Institute meetings are not being held. Could your meetings be held in March or in November, before the Farmers' Institute meetings commence? Just a very short distance from here, Farmers' Institute meetings were held to-day and yesterday; these lecturers should have been at this meeting.

We have been fighting the packing-house men for years because they insist upon paying the same price for all sorts of pigs, a plan unfair to the farmer who sells fifty or one hundred good pigs if he has to sell at the same price as the man who produces an inferior article. But I learned at the station here to-day that they are paying for the hogs according to their value. That is encouraging to the intelligent worker. You buyers are not buying cheese on their merits. Why not? Why pay a level price for all cheese, good, bad or otherwise.

In the old country I learned that people sold 9-10ths of their stock by auction. A

man living near a town knows that every Saturday there is an auction sale of stock, and that he can buy or sell what he wants to buy or sell. He does not have to induce a buyer to come to his place and dicker with him. That is the one thing that drove me out of the beef-growing trade, because I had to dicker with a drover. Fifty or sixty years ago the English people began to sell in this way. All over England and Scotland there are markets where men can sell all they have to sell, from a calf to a bullock, from a lamb to a full-grown sheep, from a little store pig all the way up ; they are put on these markets and sold by auction. This system has grown from year to year, and I see no reason why we cannot do this in this country. Two or three years ago we established auction sales for pure-bred animals at Guelph, Ottawa and Calgary. What was our reason for doing so ? Hundreds of men throughout this country were producing first-class animals, but they did not produce enough to pay them to advertise. They are good farmers, but they are not good salesmen, and in order to help these men we have established these sales. Some of these men, when they sold their animals, very often sold to speculators, and they resold them at large profit. The secretaries of the Agricultural Societies all over Canada are buying more or less males for the use of their members. The same thing is done in Scotland, in Ireland, and in England; they are doing it to a great extent in Nova Scotia. How are these men going to buy them ? I have known men who wanted to buy a pure-bred animal to spend half as much money looking for him as they paid for the animal. In order to bring these men together, Mr. Dryden, in his wisdom, allowed the Live Stock Association to hold sales in Guelph, where, on the 26th of February this year, there will be 80 pure bred cattle sold; also some pigs. At Ottawa, on February 12th, there will be the same number auctioned. Men who want to buy can see 80 animals together, and buy what they want. The plan is working very well, and I hope to see it established in all parts of Canada; not only for pure bred animals, but for all sorts.

There was a lot of matter of great importance in the paper read by Mr. MacLaren on transportation. What are you going to do with that paper ? Are you going to let it lie over till next year ? I think you should appoint a committee who will keep this matter going. Mr. MacLaren comes before this convention and tells you such and such is a fact, but you must go home and solve the matter. You should appoint a committee, with a secretary who means business ; with a secretary who has got time to take it up and fight it out and keep at it all the time. I will tell you what occurred about ten years ago. I said the live stock men were of great service to the country, and it would be in the interests of the railway company to carry all thorough-bred live stock at half price. The breeders said it was a good thing, but never could be brought into effect ; that the railways would not listen to us. I said: "If you will appoint a committee to go with me, I will go to-morrow and see." They did so, and we saw the railway officials. They said: "What can we do for you to-day," and we told them; and they said, "Do you think we are a pack of fools, and that we do not know how to run the railway." We told them it would be a good thing for them, that it would produce more export cattle of a better class. They said "Gentlemen, we have heard you, and we will take this matter into our serious consideration," and we did not hear anything from them. But that committee kept at work. I wrote a circular saying what I thought ought to be done, and what effect it would be a good thing for them, that it would produce more export cattle of a better class. I kept on pushing. The people thought I was wound up ; I kept at it for seven years, and every year the railway men had me to badger them. At the end of that time we secured half rates on all pure bred stock, shipped from one point to another in Canada. (Applause.)

I tell you this, not because there is any credit due to myself, but to encourage you to stick to this work, to keep pounding away. Nominate a committee, and insist that they shall report to you, and appropriate funds for the work. Take this paper of Mr. MacLaren's and send it to every M.P. throughout Canada, and to every newspaper man. You have no right to ask the Government for anything until you have made public opinion. It is not right to ask the Government for anything until you have got public opinion with you on that point ; but when you have brought pressure enough to bear, you

can make the railways do anything you want. The live stock men can go to Montreal and ask for almost anything, but when we first went down there they asked us: "Who do you represent." We could only say the Shorthorn Breeders' Association. By and bye we went back and we had two thousand men at our back who were willing to put up a dollar each to see the thing through. If you keep on you will be able to do the same as we did.

RESOLUTIONS.

Mr. Pattullo : Last year, in the proceedings of the Association, regret was expressed that the City of Toronto had not provided an adequate room for the dairy industry at the Industrial Exhibition. Having expressed that regret, I think we should also express our satisfaction that, through the efforts of Mr. MacLaren and others, they have now appropriated sufficient funds to erect a magnificent building, where our exhibits can be properly represented, and I desire to move that the satisfaction of this Association be expressed at the action of the City of Toronto, especially with regard to the equipment of the dairy building, and that the President and Secretary of this Association be asked to prepare a formal resolution in accordance with my motion, and that a copy of it be sent officially to the Secretary of the Industrial Exhibition and to the City Clerk of Toronto.

The motion was seconded by Mr. MacLaren, who said : I have been the biggest kicker about the accommodation the dairymen have had at the City of Toronto for the last number of years, and I have very great pleasure in seconding the motion. Toronto has done well in offering to put up a nice dairy building, and I hope every dairyman in the country will help to make the dairy exhibit a success. I have very much pleasure in seconding the motion. The motion was carried.

Moved by Mr. Ballantyne, seconded by Mr. Paget : "That the Secretary of this Association be directed to address a communication to the Honorable the Minister of Agriculture at Ottawa, asking him to take such steps as will insure a sufficient supply of refrigerator cars for shipment of cheese during the summer season, and also provide icing stations at shipping centres." Carried.

Moved by A. F. MacLaren, M.P., seconded by J. N. Paget: "That the question of transportation of Canadian products, through improvements in the canals and waterways, and in the St. Lawrence River, having been brought to the attention of this Association at its annual convention ; this Association desires to express its opinion of the extreme importance of such improvements being made, in order that the Canadian producers may be placed in the very best position possible for competition with the producers of other countries for the British and foreign trade. And that a copy of this resolution be transmitted to the Honorable the Minister of Railways and Canals." Carried.

Moved by Mr. Eagle, seconded by Mr. Ballantyne : "That the members of this Association desire to place on record their high appreciation of the welcome and assistance extended to him during the period of their annual convention by the Mayor and Council, the President of the Board of Trade, and the Citizens of the City of Brantford. for the use of the Opera House and the City Hall, but even more so for their kindly courtesies." Carried.

The Convention adjourned by singing "God Save the King."

WISCONSIN EXPERIMENTS IN CURING CHEESE IN COLD STORAGE.

By Dr. H. L. Russell, Wisconsin Experiment Station, Madison, Wis.

The work which I have to report this afternoon is practically a continuation of the work which was presented to your body a year ago. We have been working upon the curing of cheese to determine if in some way we cannot improve the quality of cheese by varying in one way or another the method by which it is cured. Cheese differs so much from butter in that, when it comes from the vat, it is practically a worthless substance, and it only receives its value from a commercial point of view due to those profound changes which occur in what is known as the ripening process.

Experiments which we have been making have been with reference to the use of very much lower temperatures than those heretofore employed

In making these experiments a large mass of milk was taken, and from that was made a number of cheese under exactly the same conditions. These cheese were made all in one vat, so as to secure uniform conditions with reference to manufacture, and then they were placed at various ripening temperatures, ranging from 15 degrees Fah. up to 50 degrees Fah., at several different degrees of temperature. Under those conditions, if we secure a very marked difference in the products it ought to be attributed to the ripening temperature, inasmuch as the manufacture was the same throughout.

Best Results at 30 to 40 Degrees.

Our experience has demonstrated that the quality of the product which was secured under those diverse temperature conditions was in general better the lower the temperature we cured the cheese at, with the exception of those cured below the freezing point; though in spite of the fact that it was kept below the freezing point, there was a fairly good cheese when handled subsequently after it was taken from the cold storage room. The cheese which we have found to be the most successful, that is, the best quality of cheese, were those which were cured at a temperature ranging from 30 to 40, or thereabouts; these were better than those at 50; the 50 were better than the 60; and this leads us to believe that the use of very much lower temperatures than have heretofore been considered advisable may be made with very considerable success in ripening cheddar cheese.

There are just a few points with reference to these cold cured cheese that I wish to call your attention to. In the first place, there is the question of flavor. The flavor of these cheese cured at these abnormally low temperatures is very mild. It is a pure, straight, clean flavor in every way, in spite of the fact that it is more or less of a popular opinion, I believe, that cheese cured at what we might call cold storage temperatures very frequently has a bitter flavor; these cheese we have never found, cured at temperatures ranging from 33 to 15 degrees, to possess a flavor which was abnormal. It is not so marked a flavor, but it is a perfectly clean, pure flavor, although mild.

Texture Wholly Satisfactory.

With reference to the texture of these cheese, in many respects they were, as Mr. Baer, who judged them, put it, practically perfect. Those cheese were thoroughly broken down, so that the texture was as satisfactory as could be asked for.

It is noteworthy that a comparison of the cheese from a physical point of view, in connection with the chemical analysis, shows that these cheese were not decomposed

* At the convention of the Eastern and Western Dairymen's Associations, as reported in this volume, much attention was given to the subject of curing cheese at a low temperature, and several speakers referred to the first experiments in this connection, as conducted by Drs. Babcock and Russell, of Wisconsin Experiment Station. It has been thought advisable, therefore, to reproduce from *The Weekly Sun*, Toronto, of the 5th of February, 1902, this report of an address delivered at the recent meeting of the Wisconsin Cheesemakers' Association, and furnished to that journal by Mr. Archibald Smith, of the Western Dairy School, Strathroy.

chemically, as far as their physical appearance would indicate. That is to say, physically, they are apparently broken down further than the chemical analysis would ordinarily lead us to expect.

With reference to the body of the cheese, they were close and meaty in body, except in those cases where excessive quantities of rennet were employed. We have used in these experiments two or three times the quantity of rennet ordinarily used, say, six or nine ounces; and in those cases the cheese, as they increased in age, had a tendency to become slightly open or loose. We have, I believe, the right explanation of this looseness, that it is due to the shrinking of the curd, due to the action of the rennet itself, the rennet causing a continual and slow but constant shrinking of the caseine mass, and, therefore, when these larger quantities were employed, there is a tendency of the curd to continue to shrink, and, of course, as it increases in age, this has a tendency to make it slightly open.

With reference to the color of the cheese, they were perfectly even in color, except in those instances where the body of the cheese was a little loose, in which case the color was cut around these openings. This, I should say, only happens in the case of cheese made with much larger quantities of rennet.

What are the White Specks.

There is one other characteristic of these cheese which is quite remarkable, not only from the practical point of view, but at the same time from a scientific point of view. In cheese cured at 40 degrees or below, there appears throughout the entire mass of cheese very small, almost microscopic, white specks. The nature of these I need not go into here in connection with this subject, that is still under investigation. These white specks are not apparent when the cheese is in the cold storage room, but when a cheese is taken out and warmed up these very minute white specks occur. At first we thought this was very serious, a handicap upon the appearance, these white specks, and that they would militate a good deal against the sale and the quality of the product; but Mr. Baer, in his work throughout the State, has had occasion to examine the product in store in different portions of the State, and he has found that more or less of these white specks is not at all uncommon; that, in fact, in most of the storage goods which he examined they were apparent. They are not readily to be noticed in the early stages, they cannot be easily recognized; in fact, we recognized them upon the photographic plate before we did with the unaided eye, and afterwards we found upon very close examination, that they were found to occur in all of that product. They have absolutely no effect upon the flavor of the cheese, and do not injure it in any way, except, of course, where they might be present to such an extent that it would cause a question in the mind of the consumer as to what they were. From the fact, however, that they appear in all cold storage goods, and they have not, so far as we know, occasioned any concern in the market—that is, buyers buy these goods and do not pay any attention to it—we are led to believe that the matter is entirely inconsequential; and, indeed, this appearance, these very minute points in the cheese, constitute, as it were, a trade mark of cheese cured according to this method, because they do not appear in cheese which is cured at 40 degrees and above, but are almost invariably present in cheese cured at 40 or below.

The Scoring and Market Test.

Now, the quality of the cheese, as found in the flavor, the texture, the body, and the color, is on the whole better than that of cheese cured under higher temperatures. These cheese have been examined by our own experts and by cheese experts who knew nothing whatever of the way in which the cheese had been handled, not only in Wisconsin, but Canadian experts and Eastern experts have pronounced them an exceedingly fine cheese, a good deal better than the market ordinarily produces.

Of course, in one sense, we are aware that it is rather unsafe to judge of the market value of goods in this class in comparison with the general market; but so far

as it is possible for us to give a commercial score to these cheese in comparison with a standard score, they have not infrequently ranked considerably, from a half to three-quarters of a cent, or even, I think, a cent a pound, more than the regular product.

Not only has it been found that the quality of the individual cheese itself was improved, but those ripened at higher temperatures, but there are other advantages which come from the use of this system. Take, for instance, the matter of flavor. I say that the flavor produced by these lower temperature-cured cheese is exceedingly mild, although the texture is broken down, and frequently it gives you a soft, mellow cheese, with a mild flavor, even though the cheese may have considerable age. It is possible to intensify the flavor of these cheese in a very simple manner. If these cheese, after they have been thoroughly ripened, physically entirely broken down, still have a perfectly mild flavor—if these are taken out and brought into a higher curing temperature, say 60 degrees or thereabouts, you can intensify the flavor to almost any degree you have a mind to. In that way it becomes possible with well-matured old cheese to get rid of those sharp tan flavors so liable to be with the ordinary manufacture. This is desirable, I believe. You may have a very mild, thoroughly broken down cheese, or you may intensify that flavor by this subsequent sort of curing process.

Assists in Securing Uniformity in Product.

Then, again, the question of uniformity comes in. It is possible to make a more uniform product. The daily complications are so great as to practically, in some instances, defeat the skill of the cheesemaker. With these lower temperatures it is possible to produce a very much more uniform product.

Then, again, there is the factor of the keeping quality of these cheese—they are slower in ripening, but they are a great deal longer in passing through what we may call the commercial life of the cheese, so that instead of the cheese reaching its best and then soon declining, these cheese are a great deal longer in passing through what may be called a marketable or commercial period. This, of course, is an advantage which is very evident.

Again, we have the matter of the diminution of losses in the ripening of cheese in the usual factory. Now, not only is the question of quality important—flavor, texture, etc.—as determining the quality of the cheese, but there is a loss due to the drying, the evaporation of the moisture from the cheese. This is much less usually with cheese cured at lower temperature than those cured at 60 or thereabouts.

Again, we have the matter of abnormal taints. We have found that where milks are slightly tainted to begin with the taint was not nearly so pronounced in that cheese if cured at 40 degrees as if it was cured at 60 or thereabouts.

Molding Prevented by Low Temperatures.

Then, one more factor is the matter of molding. The molding of cheese is, of course, a biological phenomenon, due to the sprouting of mold spores, occasioned by the development of the mold on the surface of the cheese, brought about with the proper temperature and moisture. Mold will invariably occur when the degree of saturation in the atmosphere reaches the maximum point, and under these conditions under the ordinary temperature at which cheese is ripened you have more of loss, or at least trouble from the molding of the cheese. We find that with cheese cured at 40 degrees or thereabouts these molds will not develop—they cannot grow because the temperature is too low for them to develop, so that those losses are to a large extent obviated by the use of those lower curing temperatures.

The Cost Side of It.

Now, there is a matter of expense to be considered in this process, because, in order to be able to cure cheese at 40 degrees or thereabouts, it becomes necessary to use some other than ordinary methods. There is increased equipment, and there is also the factor

of time to be taken into consideration. The ripening process takes longer to go through under such conditions; therefore, the factor of interest comes in. It has been found that it is possible to diminish this extra time by the use of higher amounts of rennet, and that we do not get the disadvantages which come from the use of rennet under ordinary conditions. The use of six or nine ounces of rennet ripened with ordinary surroundings gives a very sharp flavor; these cheese cured at 35, 40, and 50, after using the extra rennet, do not have that sharp and undesirable flavor, and at the same time it hastens the ripening process, so that the time element is not of so much importance, because it permits the use of the larger quantity of rennet under conditions where the disadvantages do not come from the use of this extra rennet, and while it is possible that it will take somewhat longer time than to cure cheese under ordinary conditions, yet that time is not very greatly increased. I have cheese ripened under those conditions which has been held at 40 degrees, and its entire ripening period is due to the changes taking place under those conditions.

This cheese here is made with three ounces of rennet and two and a half ounces of salt, and it is now seven months old. We went to Mr. Noyes' factory, down in Richmond County, and there secured the output of a whole day. These experiments were not experiments under laboratory conditions, where a mass of milk has been taken and worked up under experimental conditions. These experiments have been made on what you might call a commercial scale, and we have somewhere in the neighborhood of forty or fifty thousand pounds of milk which has been handled in this way, so that the conclusions which have been derived from these series of experiments, which now cover a period of something like four years, are entitled to more value than they would be if they had been confined to laboratory conditions. There will be an opportunity to test this cheese, and you can see for yourselves, perhaps better than I can tell you, what you think of the product, whether the quality of cheese which has been cured under these conditions is satisfactory or not.

Now, with your permission, I think the few words I have to say with reference to the other subject had perhaps better come in here before we cut the cheese.

Relative Advantages of Consolidated Cold Curing Stations for Cheese.

The experiments to which I have referred lead us to believe that if we use lower temperature than have heretofore been employed, we can secure better results, not only a better quality of cheese, but we can diminish the losses, which would otherwise obtain, and at the same time materially improve the conditions in other ways, so that from the dollars' and cents' point of view it is well worth considering. Of course, however, it is manifestly out of the question for each cheese factory to go to work and construct a curing room in which the insulation is perfect enough to enable us to secure a temperature of 40 degrees or thereabouts. Some years ago the proposition was made at the Dairymen's Convention with reference to centralized curing stations for the ripening of cheese. It seems to me that if this process is a success, that in place of each factory building its own curing-room and putting $500 or more into a sub-earth duct, or some sort of improvement along that line, that it is a great deal more economical for use to combine—co-operate—so that we may secure maximum results with minimum expense; that it is possible for us to ship cheese from the different factories to some central point at which a properly constructed curing room can be made, which can be handled so that the quality of cheese will be much improved thereby. It is possible, not only to improve the flavor, but to diminish the losses in this way. There are other advantages to come from this production of the cheese in large lines, so that buyers can buy a considerable quantity of it at one time. In this way it is possible, through the use of this consolidated cold curing station, where cheese is shipped from various points to be cured, to produce cheese under the minimum expense. These cheese can be put in right directly from the press.

Experiments in Shipping.

The experiment has been tried of shipping cheese from Iowa to Canada and from Canada back to Iowa in order to see whether they would stand the journey without impairment in quality, and those cheese, sent six or eight hundred or thousand miles, have been placed under these curing conditions, and they came out A No 1 cheese, so that the question of distance is no factor whatever in this matter.

Now, this is a possibility for not only the consolidation of factories under one management, but it is also equally applicable to co-operation in any central locality of various factories. Here are twelve, fifteen, or twenty factories, receiving milk in contiguous territory, and in place of each one building an independent curing room and curing the cheese themselves under adverse conditions, this cheese can just as well be sent to a common source, where it can be handled better and with more economy, and it seems to us that with the inauguration of this cold curing type of cheese that the cheese industry of Wisconsin can be given an impetus forward which will put it in the front rank, where it can always stay.

A general discussion followed.

Mr. Aderhold: How about the rinds on those low cured cheese—as to whether they will stand up ?

Dr. Russell : There is rind enough so they stand up, and hold their shape, even though they are put in directly from the press. This cheese was put in from the press. It was brought from Muscoda, about twenty-four hours on the road, and put right into a temperature of 40 degrees, immediately after. The flavor can be materially increased in this cheese, but the point is that you get the broken down condition and the mild flavor and then you can intensify that flavor by development at a slightly higher temperature. In that way there is no liability to huff, the abnormal conditions to be avoided.

Mr. Michaels : Was there any color put in that cheese ?

Dr. Russell : No, this is an uncolored product.

Mr. Mason : Could you cure that in less than seven months ?

Dr. Russell : Well, I do not know. I do not think that you could get it as far along as it is in much less time. What do you think about it, Mr. Baer ?

Mr. Baer : I think not less than six months.

Dr. Russell : There was three ounces of rennet to the thousand pounds of milk used here. Now, you can hurry the ripening process by doubling the quantity of rennet, and you can do it in perfect safety ; you get no bad flavor in any way. You can use six or even nine ounces of rennet, as we have done in our experimental work.

REPORTS OF THE DAIRY SCHOOLS OF ONTARIO.

AGRICULTURAL COLLEGE DAIRY SCHOOL, GUELPH.

James Mills, M.A., LL.D	Director.
H. H. Dean, B.S.A	Prof. Dairy Husbandry and Superintendent.
G. H. Barr and R. W. Stratton..	Instructors in Cheesemaking.
Mark Sprague..................	Instructor in Separators, Piping, Repairing, etc.
Jas. Stonehouse	Instructor in Buttermaking.
J. A. McFeeters................	Instructor in Milk-testing.
Miss Laura Rose................	Instructress in Buttermaking, Farm Dairy.
C. W. McDougall...............	Instructor in Separators and Milk-testing, Farm Dairy.
F. C. Harrison, B.S.A..........	Lecturer and Instructor in Dairy Bacteriology.
Wm. Gamble, B.S.A.............	Lecturer and Instructor in Dairy Chemistry.
Mrs. Jean Joy	Lecturer and Demonstrator in Home Economics.

The following is a brief report of the Central Dairy School in connection with the Ontario Agricultural College for the year 1901, and for the term from January 3rd to March 27th, 1902:

During 1901 there were 65 students registered for the twelve weeks' course from January 2nd to March 22nd, and fifteen for the three weeks Creamery course in December, making a total of 80 far the year. For the term of 1902, 88 students registered for the Dairy courses, and 96 for the course in Home Economics. In addition there was a special lecture on Cooking for farmers' wives and daughters at the close of the term, at which about 80 were in attendance, making a total of 264 students registered from January 2nd, 1901, to March 27th, 1902. If we add to this the large number who attended a few of the lectures in Home Economics, but who did not register, those who came to the school for a few lessons on the use of the alkaline test, best methods of arranging creameries, cold storages, advice regarding dairy appliances, etc., and also the special class in cooking, the attendance has not been far short of 350. We have a large number who come each year for some special information who do not register, and yet the Dairy School is of great value to them. This class of students do not appear in the list of those who receive instruction, yet they are largely benefited by the School.

The following counties, districts, etc., have been represented by students during the terms: The Argentine Republic of South America, Brant, Bruce, Carleton, Durham, Dundas, Elgin, Essex, Glengarry, Grey, Halton, Haldimand, Hamilton, Hastings, Huron, Lambton, Lanark, Lennox, Leeds, Muskoka, Middlesex, Northumberland, Norfolk, Nova Scotia, New Brunswick, Northwest Territories, North Dakota, U.S.A., Oxford, Ontario, Peel, Perth, Prince Edward, Quebec, Russell, Simcoe, Toronto, Vermont, U.S.A., Victoria, Waterloo, Welland, Wentworth, Wellington, and York.

The increased attendance of ladies is gratifying, especially is this so during the past term, when 23 ladies registered for the Dairy Courses, three of whom took the full factory course. The addition of a course in Home Economics has doubtless induced those who desire to know more about dairying, poultry and housekeeping, especially the economic preparation of foods, to come in larger numbers.

The large increase in the supply of milk for the term has been of great service in giving additional practical instruction. The class was also supplied with cream furnished by patrons who use separators or cream the milk by gravity. This cream was tested with the oil test churn and churned separately from the cream separated at the school. We were obliged to sell the butter made from this cream at from one-half to one cent a pound less than was obtained for the butter made from the cream separated in the school owing to its poorer quality. However, the students obtained a good deal of practice in the handling of cream as delivered at a cream-gathering creamery which compensated for any financial losses sustained.

The work of instruction has been carried on similar to that of last year. Instead of one week at practical work in the bacteriological laboratory, two weeks were given in 1902.

Instruction in piping, repairing tinware, leaks in valves, etc., has been given as usual, but we have lacked a special room for this work. It is our intention to provide a special place for this class of instruction in 1903, and to add the putting up of shafting and pulleys and the operation of an engine. Two students will also be detailed each day for instruction in firing the boilers at the school and in running the engine. It is also proposed to have an advanced class in cheesemaking in 1903. All students with more than two years' experience in cheesemaking will be put in a class by themselves under the charge of Mr. Barr, who will take up advanced work. If students wish to do so, they may take cheesemaking only, or combine with it milk testing and laboratory work in dairy, chemistry and dairy bacteriology. So much attention is now being given to butter that we are in danger of losing our hold on the cheese trade before we get the butter business properly established. This would be a calamity for the dairy industry. Experienced cheese makers may know that at any time they wish to come to the College between January 2nd and March 26th, 1903, they will find something of special interest for them in the cheese room. There is a danger of experienced cheese makers coming to the conclusion that there is nothing for them to learn at a Dairy School. We hope to be able to convince these men that there is yet a great deal to learn about cheese making. With Mr. Barr as instructor this branch of the School ought to be a great help to the cheese industry, which is in danger of suffering from indifference.

We expect to add a mechanical refrigeration plant to our equipment during the present year. We are also in a position to accept a limited number of students for practical work in both cheese and butter making during the summer months. There are already nearly enough applications to fill all our space for the season of 1902.

The Dairy School in connection with the Ontario Agricultural College was never in a position to more perfectly meet the demand for practical and scientific instruction in dairying than it is to-day, and we hope to make such improvement in the courses from time to time as will meet the growing demands of dairymen.

H. H. DEAN, Superintendent.

Guelph, March 29, 1902.

EASTERN DAIRY SCHOOL, KINGSTON.

G. C. Creelman, Toronto .... Director.
J. W. Hart .... Supt. and Instructor in Cream Separating.
G. G. Publow .... Instructor in Cheesemaking.
L. A. Zufelt .... Instructor in Milk-testing.
Robert Ireland .... Instructor in Buttermaking.
D. M. Wilson .... Assistant in Cheesemaking.
F. McGowan .... Assistant in Buttermaking.
Thos. Perry .... Engineer.
W. T. Connell, M.D .... Bacteriologist.

For the year ending December 31st, 1901, the following report is submitted:—The number of students in attendance from the first of January until the close of the school April 3rd, was 68; from the period when class work was resumed on the 2nd of December, 24 students registered before the close of the year, making a total attendance for the year of 112.

With few exceptions the students reside in Eastern Ontario, and are regularly employed in making factory cheese and creamery butter during the summer months.

There are no special facilities here for students expecting to engage in home dairy work, although a few of this class attend. Were systematic instruction given along this line it would be a great benefit in improving the quality of butter produced on our farms, and it is to be hoped that provision may be made in the near future to meet the needs of those who are engaged in home dairy work.

During the long or Certificate Course, January 17th to February 27th, 1901, 25 students were in attendance in the cheesemaking department, while twelve took the course in butter making. In the examinations held at the close of the course fifteen wrote on cheese making, of whom ten passed, and seven wrote on butter making, six of whom were successful. Certificates of proficiency were given, six of the students who passed the long course examinations in cheese making, and who since that time have demonstrated their ability to manage a cheese factory successfully. Two certificates have been granted students who conducted creameries.

Milk was supplied by 64 patrons. The Clarified Milk Company of Kingston, Limited, furnished a large proportion of the milk used in cheese making. During the months of January and February it was found difficult to secure an adequate quantity of milk for the uses of the school, but I am glad to be able to report that the outlook is favorable for larger supplies in the future. The amount of milk received each month with the particulars of its manufacture are given in the following table:

MILK FOR BUTTERMAKING.

Month.	Lb. Milk.	Average per cent fat.	Lb. Fat.	Lb. Butter.	Lb. Milk to 1 lb Butter	Lb Butter per lb of fat in milk.
January	34,700	4.33	1,491	1,639	21.11	1.10
February	40,846	4.20	1,717	1,812	22.17	1.07
March	69,279	3.93	2,724	3,004	23.06	1.10
April 1-20	82,825	3.69	3,057	3,352	24 71	1.09
Nov. 18-30	79,435	4.88	3,879	4,042	19.65	1.04
December	123,871	4.92	6,137	6,651	18.62	1.08
	430,956	4.41	19,005	20,530	20.99	1.08

MILK FOR CHEESEMAKING.

Month.	Lb. Milk.	Average per cent. fat.	Lb. Fat.	Lb. Green Cheese.	Lb. Cheese per lb. of fat in milk.	Lb. Milk. to 1 lb. Cheese.
January	28,112	4.13	1,161	2,948	2.54	9.53
February	25,370	4.02	1,019	2,525	2.46	10.04
March	34,574	3.77	1,302	3,240	2.48	10.69
April 1-3	4,252	3 67	156	392	2.56	10.58
Dec. 2-31	20,836	4.45	928	2,270	2.45	9.18
	113,144	4.03	4,566	11,375	2.49	9.95

In the short courses the work was so arranged as to give the greatest possible amount of training and practice in the space of three weeks. A course of eighteen lectures was given, covering the subjects of dairy husbandry, breeding and feeding the dairy cow, the elaboration and composition of milk, the principles involved in the manufacture of cheese and butter, the conditions which influence the quality and yield of cheese and butter, and kindred topics. No certificates were given in the short courses.

The long course, January 16th to February 26th, was given for those men who desired a more advanced course of dairy instruction, and who were desirous of fitting themselves for responsible positions in their chosen line of work.

The practical work of the school is carried on in two departments, namely, butter making and cheese making. Students desiring instruction in both subjects

complete one before taking up the other. Dairy bacteriology and milk testing are taught in all courses.

The butter making department is equipped with all the leading styles of hand and power separators, milk pasteurizer, cream pasteurizer, cream vats, combined churns and workers, trunk churn, revolving table butter worker and other apparatus. The students in this department are divided into three sections; after the morning lecture from 9 to 10 o'clock, one section is assigned work in the separator room, one in butter making and the other in testing milk. In running the different separators students are required to make daily records of the capacity, speed, temperature, etc. Practical observations of the effects of variations in the conditions are frequently made so that the students learn the limitations under which the several separators employed will do good work. Cream is churned at different temperatures and degrees of ripeness, and the butter is worked and salted in various ways, so that the students may become thoroughly familiar with the process of making fine butter for the requirements of different markets as practised by the most skilful makers. The whole milk, skim-milk and buttermilk are tested daily in order to locate the losses in separating and churning.

The cheese-making department is equipped with all the apparatus necessary for making Canadian cheddar cheese, including six cheese vats, upright and gang presses, and the leading makes of curd mills. Students are drilled in the use of different rennet tests, Lloyd's test for acidity and the hot iron test. The preparation and use of "starters," handling over-ripe and gassy milk, the effect of varied quantities of rennet, the amount of acid at dipping, high piling, washing curds, and other matters of practical importance to cheese makers, are studied in detail. The fermentation test is in constant use; the students being trained in locating taints not easily detected in the ordinary examination of milk. The student in charge of a vat is expected to see that his cheese is neatly bandaged and properly pressed. Every step in the process of cheese making is explained in full and discussions on cheese making are held daily while the practical work is being carried on.

As bacteria play such an important role in all dairy operations, the subject of bacteriology is given special attention through lectures and demonstrations by Dr. Connell of the Medical College of Queen's University.

Additions are being made to the library from time to time, and it is now well stocked with the standard works on dairy husbandry and technique. The library is open for an hour each day for the exchange of books. The leading agricultural and dairy journals are kept on file.

Students desiring the same are given instructions in the management of boilers and engines, lining shafting, pipe fitting, etc.

In the testing room the various tests applied to milk are studied, and a thorough drilling in the use of the Babcock test and the lactometer is given. Students are taught how to detect the various adulterations of milk, both in regard to extent and kind. The number of factories that pay by test is increasing, and several students came to the school entirely for the purpose of qualifying themselves to pay by test in their factories.

It is necessary that a cheese maker should know how to test milk in order that his patrons will have confidence in his ability to protect their interests. In paying for the milk used in the school the composite test is used. The students are shown how to calculate the loss of butter-fat in skim milk, buttermilk, and whey, and are made acquainted with the details of the business management of creameries and cheese factories.

A number of prominent dairymen from a distance visited the school while classes were in session and addressed the students. The Director, Dr. Jas. Mills of Guelph, paid the school an official visit in January.

The students held several evening meetings, when papers were read followed by discussions; such meetings are a benefit in giving those who took part in them practice in public speaking.

A great many students continue to attend the school year after year, and it is this class that directly receive the greatest benefit from the school. These are also the men who are doing much to improve the quality of our cheese and butter, and are of the greatest help to the patrons of the cheese factories and creameries that employ them. To meet their needs the standard of instruction is being constantly raised, while at the same time the interests of the students who attend the school for the first time are in no wise neglected.

The school is now strongly entrenched in the regard of the dairymen of Eastern Ontario, and the outlook is that when the session of 1901-2 closes there will have been registered the largest attendance in the history of the institution.

(Signed) J. W. HART, Superinendent.

Kingston, March 28th, 1902.

WESTERN DAIRY SCHOOL, STRATHROY.

G. C. Creelman, Toronto....Director.
Archibald Smith ....Superintendent and Instructor in Cream Separators and Buttermaking.
Geo. E. Goodhand ....Instructor in Cheesemaking.
Frank Herns .... " Milk-testing.
James Bristow ....Assistant Instructor in Cream Separators.
R. M. Smith................ " " Buttermaking and Machine Shop.
Miss Bella Millar ....Instructress in Home Dairy.
C. F. Neu, M.D.......... Bacteriologist.
J. P. Whitehead, V.S.......Veterinary Science.

The Western Dairy School reopened on December 2nd, 1901, for a special creamery course of three weeks' duration. This course was intended especially for those who wished to take charge of winter creameries and who could not take the long course.

The attendance this year has been the largest in the history of the school. This was partly owing to the success of former students, who with one exception won the best prizes at the large exhibitions in Ontario last year. During the term 81 registered. Their experience ranged from none at all up to twenty-three years, the average experience of the whole class being over five years. The attendance by counties was as follows: Bruce, 3; Dufferin, 2; Durham, 2; Elgin, 1; Essex, 2; Grey, 1; Huron, 10; Kent, 1; Lambton, 1; Middlesex, 27; Norfolk, 1; Northumberland, 2; Oxford, 8; Peel, 1; Perth, 11; Simcoe, 2; Waterloo, 2; Wellington, 2; York, 1; and Chateauguay, Que., 1.

An important advantage which this school possesses is the large supply of milk, enabling the students to learn cheese and butter making as it is carried on under factory conditions. Besides, cream is supplied from two skimming stations, so that the students are taught how to manufacture butter on the cream-gathering system. This is undoubtedly a very important consideration, since nearly the entire supply of butter exported from western Ontario is made on this system.

Two new departments have been added to the school this year, a laboratory and a machine shop. The study of bacteriology as it affects dairying was taken up. The latest laboratory appliances were secured and the students taught how to propagate different varieties of bacteria from various sources and afterwards carefully examine the results under a powerful microscope. Thus they learned, practically, the importance of germ life in dairying and also how best to control it.

The machine shop was fitted up as inexpensively as possible to show the students how few tools are necessary to do the soldering, plumbing, pipe-fitting, etc., in a factory. They were taught also how to dissect, adjust and care for an engine, for which purpose a special engine was procured, so that they could do this work themselves instead of being merely told how to do it. This part of the course is exceedingly valuable, as it will save very much time and money in the operation of a factory, especially if there is no machine shop near.

Along with the training given in the use of the latest and best appliances in milk testing, cream separators and butter making, the students also received the benefit of many experiments in cheese and butter making. In cheese making experiments were carried on in the handling of all kinds of gassy and tainted milks and in cooking the curd and curing the cheese at different temperatures. The "Wisconsin Curd Test" was also tried and found to be a very useful method of determining the quality of each patron's milk and with what flavor, if any, it was affected. There were experiments in pasteurizing sweet and sour cream, and churning at different temperatures, and with different percentages of acid to determine the effect on the quality and quantity of butter.

The attendance of ladies in the Home Dairy Department confirmed its previous popularity and benefit in training how to make dairy butter better and more uniform and on more scientific principles.

For two weeks in February the management secured the services of an expert domestic science teacher, Mrs. E. M. Torrance, who demonstrated how to cook meats, vegetables and salads, and how to make jellies, sauces and many other wholesome, palatable and dainty dishes. The class was shown how to prepare foods to build up and maintain the body to the best advantage, and how to do it with the least waste and at a minimum cost. To show how very popular and how much appreciated these lectures and demonstrations were, it is only necessary to say that the average daily attendance was over two hundred, and that at some classes many had to be turned away as the large lecture room would not hold them.

A literary society, formed among the students in January, has helped them very much by training them to collect and express their thoughts clearly and intelligently while on their feet. One of the most beneficial introductions was the discussion of dairy topics given and answered by the students and then generally discussed. They were thus trained to tell others what they knew, and this will be very valuable to them in their intercourse with their patrons.

The conventions of farmers and dairymen, which are a special feature of this school, were more popular and largely attended than previously. The attendance was so large that it was considered advisable to have the gentlemen and ladies meet in different rooms. The ladies thus had the opportunity of hearing lectures on and discussing topics relating to their home life and work, and they thoroughly appreciated the privilege. The ablest and best speakers obtainable were secured to address the farmers on the latest and most scientific methods of dairying and farming. It is an indisputable fact that the farmers, the producers of the raw material, are the ones who must be reached and educated in order to produce the finest quality of butter and cheese. These meetings have been found to be the only practicable and the best means of thus reaching and educating them.

Good positions were secured for all the students and factories for those who were capable of operating them. Indeed the demand for good cheese and butter makers far exceeded the supply and many more could have been placed in good situations.

ARCHIBALD SMITH, Superintendent.

Strathroy, March, 1902.

PAN-AMERICAN EXHIBITION AT BUFFALO, 1901.

AWARDS TO ONTARIO IN CHEESE AND BUTTER.

Gold Medal.

Province of Ontario. The only gold medal awarded for Cheese, exhibit from July 10th to November 1st.

Silver Medal.

Dairymen's Association of Western Ontario for exhibits of Butter and Cheese.

Honorable Mention.

The following are the individual exhibits with scores, for which honorable mention diplomas were awarded :

Name of Exhibitor.	Address.	Exhibit and Score.	
Jas. R. Burgess	Bluevale, Ont.	Export Cheese	97.25
Stewart R. Payne	Warsaw "	"	96.75
E. E. Kennedy	Welland "	"	97.50
Thos. McDonald	Morrisburg, Ont	"	97.25
F. E. Kline	Lakefield "	"	98.75
J. T. Morrison	Woodstock "	"	98.75
Geo. A. Boyes	Putnam "	"	97.50
W. P. Stacey	Fullarton "	"	97.00
Miss Mary Morrison	Newry "	"	98.25
R. R. Cranston	Lawrence Sta. "	"	98.00
B. S. McConnell	Springhill "	"	96.25
John Connolly	Malcolm "	"	98.25
J. S. Isard	Paisley "	"	97.25
J. S. Isard	Williscroft "	"	97.75
A. E. Millson	Lakelet "	"	96.50
Jos. Cramer	Glenvale "	"	97.00
W. F. Gerow	Napanee "	"	98.25
J. W. Clarridge	Glen Huron "	"	98.00
Robt. Smith	Monkton "	"	98.50
Connolly Bros	Thamesford "	"	98.25
J. D. Bird	Brigden "	"	97.75
Dairy Department, O.A.C	Guelph "	"	98.75
W. H. Vont	Jasper "	"	96.75
Frank A. White	Mitchelville "	"	97.25
W. R. Kaiser	Lansdowne "	"	97.00
J. A. McIntyre	Palmerston "	"	96.50
Alex. McGregor	Russell "	"	98.50
Jas. Craighead	Havelock "	"	96.25
John Francis	Courtland "	"	98.50
Frank Travis	Courtland "	"	98.00
E. G. Marshall	Guysboro "	"	97.75
N. S. McLauchlin	Henfryn "	"	97.00
W. A. Bothwell	Hickson "	"	94.50
J. S. Johnson	Banner "	"	98.50
D. M. Willson	Rock Spring "	"	97.75
Warren Feely	Cannamore "	"	98.00
I. M. Smith	Long Lake "	"	97.25
John E. Stanton	Cotswold "	"	97.50
Andrew Clancy	Rockwood "	"	98.75
S. P. Brown	Birnam "	"	98.50
G. E. Goodhand	Milverton "	"	97.25
M. Morrison	Harriston "	"	97.25
Thos. Grieve	Wyandotte "	"	96.50
E. N. Hart	Milverton "	"	98.25
J. H. Davidson	Hammond "	"	97.00
Fred Grothier	Escott "	"	98.50
B. Dinwoodie	Lyons "	"	98.75
Robt. Johnston	Bright "	"	98.00
J.E.H. Miller	Combermere "	"	96.75
A. T. Bell	Tavistock "	"	97.50

EXHIBITS—*Concluded.*

Name of Exhibitor.	Address.	Exhibit and Score.	
O.J.B. Yearsley	Little Britain "	"	97.05
Alex. McKay	Brooksdale "	"	98.25
Wm. Stubbs	Georgetown "	"	95.25
T. B. Seller	Laurel "	"	98.00
Geo. Travis	Tilsonburg "	"	98 00
Harry Pannell	Canboro "	"	96.25
W. M. Holmes	Shanly "	"	94 25
McClure Cheese Co	Maynooth "	"	98.00
Thos. E. Young	Watford "	"	97.50
H. H. House	Walkers "	"	96.75
Walter Hamilton	Listowel "	"	98.00
D. C. Metcalfe	Glamis "	"	96.50
Albert Herrington	Russell "	"	96.75
C. A. Publow	Perth "	"	97.75
C. V. DeLong	Little Current "	"	96.25
Peter Callan	Drumbo "	"	97.00
Wm. A. Brodie	Glanworth "	"	96.50
Hugh E. Wilson	Keyser "	"	98.75
W. C. A. McKay	Courtice "	"	95.25
W. J. Douglas	Fort Stewart "	"	98.00
Geo. R. Brooks	Douro "	"	96.25
Robt. John Weir	Omemee "	"	96.00
C. C. Travis	Aylmer "	"	97.25
G. B. Brodie	Gladstone "	"	95.25
Geo. Cleal	Selby "	"	98.50
W. J. Caddey	Ingersoll "	"	95.75
S. E. Morris	Prestonvale "	"	95.75
J. A. Steiss	Heidelburg "	Limburger Cheese	96.50
Henry Minor	Canboro' "	Export Cheese	95.25
Robt. Cuddie	Woodstock "	"	94.75
D. Sinclair	Arthur "	"	97.00
Thos. F. Boyes	Lambeth "	"	97.50
R. W. Thompson	Springbrook "	"	97.25
D. A. Dempsey	Stratford "	"	97.50
W. T. Hollis	Hay Bay "	"	96.25
Benson Avery	Summerstown Sta	"	98.00
Jos. F. Ragsdale	Huntley, Ont.	"	98.00
Robt. Groat	Georgetown "	"	97.00
J. E. Fester	Port Maitland "	"	96.50
A. W. Darrock	Fordwich "	"	97 00
E. M. Johnston	Innerkip "	"	97.00
Wm. Freir	South Cayuga "	"	94.25
Owen Priddle	Courtland "	"	97.00
John H. Scott	Culloden "	"	95 50
J. H. Williams	Lyons "	"	96.50
Wm. Waddell	Kerwood "	"	96 50
W. Affleck	Clayton "	"	98.75
John Echlin	Carlton Place "	"	98.50
Edward Bryce	Perth "	"	98.75
L. H. Schneider	Monkton "	"	97.50
P. McDonald	Lakeville, P. E. I	"	94.00
Jos. Burgess	Hazelbrook "	"	96 75
R. Jenkins	Mount Albion "	"	96.50
John Smith	Pownall "	"	95.25
Chas. Myers	Lakeverd "	"	97.50
H. H. Curtis	Hawkesbury, Ont.	"	98 25
J. G. Corless	Burgessville "	"	98.00
James Whitton	Wellman's Corners, Ont.	"	95.50
Jas. Ireland & Son	Beachville "	Creamery Butter	95.25
Aaron Wenger	Ayton "	"	95.75
Wm. Parkinson	Jarvis "	"	95.00
Dairy Department O.A.C	Guelph "	"	96.00
Jas. Struthers	Owen Sound "	"	96.25
Vinemount Creamery Co	Vinemount "	"	94.50
W. H. Stewart	Frontier, Que.	"	97.00
John McQuaker	Owen Sound, Ont	"	97.50
J. C. Bell	Winchelsea "	"	94.75
W. H. Brubacher	Fergus "	"	96.75
S. R. Brill	Teeswater "	"	97.25
Jos. Babb	Gilford "	"	95.75
A. G. Calder	Dunkeld "	"	95.75
C. E. Lister	Chatham "	"	94.25
Delly Bennett	Russellton "	"	96.75

THIRTY-THIRD ANNUAL REPORT

OF THE

FRUIT GROWERS' ASSOCIATION

OF

ONTARIO,

1901

(PUBLISHED BY THE ONTARIO DEPARTMENT OF AGRICULTURE, (TORONTO).

PRINTED BY ORDER OF

THE LEGISLATIVE ASSEMBLY OF ONTARIO

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THIRTY-THIRD* ANNUAL REPORT

OF THE

FRUIT GROWERS' ASSOCIATION OF ONTARIO,

1901

To the Honorable John Dryden, Minister of Agriculture:

SIR,—I have the honor to submit the Report of the Thirty-Third Annual Meeting of the Fruit Growers' Association. This meeting excelled in attendance and interest any meeting ever held in its history, and furnished an unusual amount of valuable information for fruit growers.

I am, Sir,

Your obedient servant,

L. WOOLVERTON,
Secretary.

GRIMSBY.

* This Association was first organized in Hamilton in the year 1859, under the title of The Fruit Growers' Association of Upper Canada.

FRUIT GROWERS' ASSOCIATION OF ONTARIO.

OFFICERS FOR 1902

President .... G. C. Caston, Craighurst.
Vice-President.......................... W. H. Bunting, St. Catharines.
Secretary-Treasurer.......................... G. C. Creelman, Parliament Buildings, Toronto.
Editor of Canadian Horticulturist.......... L. Woolverton, Grimsby.

DIRECTORS.

Agricultural	Division No.	1	R. B. Whyte, Ottawa.
"	"	2	W. A. Whitney, Iroquois.
"	"	3	Harold Jones, Maitland.
"	"	4	W H. Dempsey, Trenton.
"	"	5	H. J. Snelgrove, Cobourg.
"	"	6	Elmer Lick, Oshawa.
"	"	7	Murray Pettit, Winona.
"	"	8	E. Morris Fonthill.
"	"	9	J. S. Scarff, Woodstock.
"	"	10	W. W. Cox, Collingwood.
"	"	11	T. H. Race, Mitchell.
"	"	12	Alex. McNeill, Walkerville.
"	"	13	C. L. Stephens, Orillia.

Honorary Directors—Thos. Beall, Lindsay ; A. M. Smith, St. Catharines.

AUDITORS.

A. H. Pettit, Grimsby. W. M. Orr, Fruitland.

COMMITTEES.

Executive—President, Vice-President and Secretary.

Board of Control Fruit Experiment Stations—Messrs. W. M. Orr, A. H Pettit, and W. H. Bunting.

New Fruits—Prof. H. L. Hutt, O.A.C., Guelph ; Prof. W. T. Macoun, C.E.F., Ottawa ; L. Woolverton, Grimsby.

San José Scale—M. Pettit, R. Thompson, G. E. Fisher, E. Morris, W. M. Orr, W. H. Bunting, John Wigle, Major Hiscott.

Codling Moth—Joseph Tweddle, E. D. Smith, W. M. Orr, A. H. Pettit.

Journal—G. C. Creelman, T. H. Race, A. H. Pettit.

Transportation—H. W. Dawson, Toronto ; R. J. Graham, Belleville ; E. D. Smith, Winona.

FRUIT GROWERS' ASSOCIATION OF ONTARIO.

ANNUAL MEETING.

The annual meeting was held in the Court House, Cobourg, beginning at half-past nine o'clock on Wednesday morning, December 4th, 1901.

The President, Mr. Wm. Orr, in calling the meeting to order, said: I am glad to meet so many of you this morning, and to note that all our officers and directors are with us. Also that we have several gentlemen from our sister Provinces, Quebec and Prince Edward Island, and two eminent gentlemen from the United States. Our programme is very full and interesting, embracing questions of great importance to the fruit-growers of Ontario. Prominent among them is the question of fruit packages, and another, that of the transportation of fruit, and these, I am sure, will receive your best attention. Our object is to make progress all along the line.

The Secretary read correspondence from S .C. Parker, secretary of the Nova Scotia Fruit-Growers' Association, expressing the hope that there might be an exchange of visiting delegates; from Rev. A. E. Burke, of Alberton, P.E.I., expressing the hope of being present at the meeting; from Prof. F. A .Waugh of Burlington, Vt., accepting the invitation to address the meeting; from D. W. Beadle of Toronto, the first secretary of the Association, expressing his thanks for the honorary membership conferred upon him; from Chas. Lawrence of Collingwood, secretary of the Georgian Bay Fruit-Growers' Association, with regard to closer affiliation with the Provincial Association; from the Hon. John Dryden, Minister of Agriculture, regretting that other engagements would prevent his attendance; from W. W. Dunlop, secretary of the Quebec Pomological Society, giving the names of R. W. Shepherd of Montreal, and N. E. Jack of Chateauguay Basin, as delegates from that Society to this meeting; also letters from Orillia and Walkerton, inviting this Association for the next annual meeting.

The Secretary read the letter from Mr. Wellington at New York expressing his continued interest in the Association, and his willingness to exert himself in the interest of fruit growers, if continued upon the Board of the Industrial Fair.

COMMITTEES.

The President announced the appointment of the following committees :

Nominations—M. Pettit and T. H. Race (by the President), H. J. Snelgrove, J. S. Scarff and H. Jones (by the meeting).

Fruit Exhibit—Professors W. T. Macoun, F. A. Waugh and E. Morris.

Resolutions—T. H. Race, H. Jones, and G. C. Caston.

New Fruits—Professors H. L. Hutt, W. T. Macoun and L. Woolverton.

REPORT OF COMMITTEE ON CODLING MOTH FOR THE YEAR 1901.

By Joseph Tweddle, Stoney Creek

Pursuant to the amendments suggested in the report of your committee a year ago and adopted by the Association, namely :

1st. That all trees mentioned in the Order-in-Council be scraped clean of all loose and rough bark, thus destroying all hiding places of the larvae except the band.

2nd. That only trees bearing fruit be so scraped and bandaged.

3rd. That provisions be made for the destruction of the larvae of the winter brood, which provisions were not contained in the original Order-in-Council. Your committee subsequently arranged to meet the Hon. Mr. Dryden, Minister of Agriculture, and ask that such amendments be made in the Order-in-Council and upon the recommendation of the Minister of Agriculture. The committee in council repealed the original order and passed the following:

Copy of an Order-in-Council approved by His Honor the Lieutenant-Governor, the 25th day of April, A. D. 1901.

Upon the recommendation of the Honorable the Minister of Agriculture, the Committee of Council advise that the Regulations for the Prevention and Destruction of the Codling Moth, made by Order-in-Council of 24th May, 1900, pursuant to the provisions of the Noxious Insects Act (63 Victoria, Chapter 47) be repealed, and that the following be substituted therefor:

1. It shall be the duty of every occupier of a lot within the municipality, or if the land be unoccupied, it shall be the duty of the owner of such lot, after receiving notice as provided in the Act, to scrape all rough bark and all loose bark around wounds from all trees mentioned in this clause, and to place bands (as hereinafter described) upon all bearing apple trees and pear trees located upon said lot, and such work shall be completed to the satisfaction of the Inspector not later than the 10th of June each year.

2 The bands shall consist of the device known as the "Expansive Tree Protector," or shall be made of "burlap" or "sacking" or equally heavy and otherwise suitable material, and shall not be less than four inches in width and of two or more thicknesses, and shall be securely fastened at a convenient point between the crotch of the tree and the ground.

3. Except where the Expansive Tree Protector is in use, the occupant or owner shall have the bands removed and inspected, and all larvae therein destroyed, and the bands replaced, at intervals of not more than twelve days, between the 20th day of June, and the 20th day of September each year, and once each year between the 10th of November and the 10th of May following.

J. Lonsdale Capreol.

The fruit-growers of the Tp. of Saltfleet, County of Wentworth, then waited upon its council board and again asked that a new by-law be passed in conformity with the new Order-in-Council, and upon which the board made the necessary change and appointed and instructed three inspectors to carry out the enforcement of the provisions of the Act and its regulations by said Order-in-Council.

This being the only municipality known by your committee to have undertaken the enforcement, as above mentioned, and believing such enforcement and its results, so far as achieved, to be of interest to the members of this Association and the public at large, we herewith report in accordance, and we have to say that the season has been an unsatisfactory one in regard to the climatic conditions applying to the fertilization of the bloom. The continued rains and foggy weather during nearly the whole period of apple bloom permitting of only a light set of apples; but experiment with pears, these having bloomed earlier and under more favorable conditions, and set a good crop, led to a somewhat unfavorable opinion as to the necessity of the work. Apple-growers, with little or no crops, showed but comparatively little interest, while others, more largely interested in pears, and with promising crops, took a lively interest in the work.

The inspectors hesitated to enter upon their work, and even the council board were undecided, and not until a deputation of growers again waited upon them did they decide to go on with the work. A fairly energetic inspection we believe had the effect of persuading nearly all the growers in the commercial orcharding section of the township to carry out the necessary scraping and bandaging of their bearing trees. Some few contrived to evade the law, but in the stock and grain-growing parts the inspectors found so few apples set that it was generally concluded that they were not worth the cost of inspection, not one tree in 1,000 having more than a sprinkling of fruit, and scarcely any had that. The inspectors report that after the trees were bandaged they made such limited examination of orchards where negligence might be expected as to satisfy them that the work was generally being carried out in a fairly satisfactory way, and your committee are of the opinion that the fruit-growing public of the township are on the whole favorable to a further test of the workings of the Act and its regulations for another year, especially under ordinary conditions of climate and an ordinary crop.

As to results of the present year's work, we find it difficult to make any definite statement as to the reduction of the loss by the pest. The moth was very prevalent early in the summer, due no doubt to some of the larvae from the large crop of the previous year escaping and all gathering upon the very limited crop of the present season; and during the operations of the first brood it became apparent that any neglect in destroying it would result in the loss of the crop. As many as fourteen larvae were found in one apple, but the month of August being one of more than ordinary low temperature, the second brood seemed to be greatly reduced, and where thorough care and treatment were given, enough apples were saved to bring paying returns at present high prices; but where neglected it is quite apparent the crop was lost. Just how much of the crop saved was due to the cool August weather, and how much due to care, it is difficult to judge.

In the case of the pear crop, there was but little damage from the moth by the first brood, and under more favorable weather conditions and careful inspection and destruction of the larvae, later on the crop was largely exempt from damage in this respect, and was generally in this section the best harvested for years.

In regard to the cost of inspection the past season, as nearly as can be learned about $50 or $60 would cover the total expense of the partial inspection of the light crop in the township. Exact figures cannot be secured, as two of the inspectors were also appointed to look after the destruction of the black-knot and peach yellows, and did part of their work concurrently with that of the codling moth inspection; but the third, whose work was exclusively with the codling moth, and whose division covered slightly over one-third of the township, spent eleven days at $2 per day, making $22, thus making the above estimate about correct. With a thorough enforcement during a season with a full crop, would probably cost as high as $150, which would be a small item indeed providing that the crop can be largely saved by such a course, for the saving would amount to several thousand dollars in the township of Saltfleet alone.

In connection with the work some facts worthy of notice have come to light. In one case where the owners persisted in neglecting to destroy the larvae, after he had bandaged the trees, a species of borer of large size had bored under the bands and succeeded in partially or wholly girdling several trees, and to that extent injuring or killing them. This should prove a warning to such to examine their bands.

Another danger from neglect to attend to the bands is the hindrance to the birds in destroying the larvae. On the other hand, the bands seem to be a favorite and favorable breeding place for spiders, which apparently destroy the larvae through the late fall and early spring cool weather, in many cases 90 per cent. of the larvae being destroyed.

We are informed by the inspectors that where trees were well scraped all the larvae were in the bands, but where not scraped a large percentage were under the bark, and they claim success or failure will largely hinge on this.

ADDRESS OF WELCOME.

Mr. Hayden: We thought it would look fraternal to extend you a welcome to the town at this morning session. We were selfish in asking you to come here, but we realized that the Counties of Northumberland and Durham needed the benefit of such a meeting in our midst. Some of us know of the good work this Association has done for this Province and the Dominion; in fact, where would we be in the apple trade if it were not for the existence of this Association. We all know what Canada has done in the apple market. We know how we swept the boards of fruit at the Pan-American, and we realized that it was very important that we should have you among us. This summer, and in fact the last year or two, Canada has taken her part in the world, and the last summer a far more important part than ever before, and we think that by your coming here we may awaken a deeper interest in our local Horticultural Society.

Major Snelgrove: I know that every indication shows that the Convention that has just been opened will be one of the best in the history of this Association. I may say that although we have heard that the Grimsby district is the garden of Canada, we claim that the United Counties of Northumberland and Durham constitute one of the ingle nooks of that garden of Canada, and the census returns show, I believe, that the County of Northumberland alone contains the largest number of apple trees in Ontario, and I am sure you will all agree with me that the apple is the king of fruits. The oranges of the southern clime are like gourds compared with that king of fruits. I might also mention that in this County we have the largest store houses for packing and shipping of fruits, we have the largest depots where apples are gathered for export in the Dominion of Canada, and therefore it is most suitable that you should meet in the County Town of this County. I need not say that fruit growing is one of the noblest of occupations. This Association, as has been said, is the oldest and largest Horticultural Association in existence, and we are very proud of the fact that Cobourg Horticultural Society has about 100 ladies and gentlemen who are proud to be members of the Ontario Fruit Growers' Association.

The President briefly replied, thanking Messrs. Hayden and Snelgrove for their kind words of welcome.

REPORTS UPON FAIRS AND SOCIETIES.

The Western Fair (London).

J. S. Scarff: The London Fair, which has been established now a great many years, is growing all the time, and now it stands second in the Province. The Fair Grounds are beautifully located, only about fifteen minutes' walk from the Post Office or business part of the city, with cars running there every few minutes for the accommodation of visitors. The buildings are very fine, the main building of course is not as good as they have in Toronto, but the buildings for the stock will not, I think, take second place to any in the Province. The exhibits this year were very large, among the horses perhaps the largest in the history of the Fair; the cattle were also very largely represented. The main building of the Horticultural department and fruit department were well represented. The Horticultural department probably has not been better for many years. The fruit department was not as well filled up as in former years. The exhibit in apples this year was probably not more than one-third of last year's exhibit. There was a very good showing of grapes and pears, not a very good showing of plums, but on the whole a very good exhibit. The system they have of exhibiting their fruit excels, I think, anything I have ever seen, and I think the credit here due is to our friend, Mr. Race, who submitted the idea to the London Association a few years ago. The exhibits are made on tables, just set out through the hall, so that it is convenient to see and inspect the fruit. The old plan of putting them on the shelves, I think, has gone into the past ages. Mr. Race had some little difficulty at first in getting them to take hold of it, but I think the managers now see the wisdom and benefit of that system. The exhibit of fruit and vegetables was very large this year and a good exhibit.

Eastern Fair, Ottawa

Mr. R. B. Whyte: Like most fairs this year owing to the shortage of crops of fruit our exhibits were much smaller than of old. The quality, however, was good. At Ottawa we have cut off prizes for some of the fruits we cannot possibly grow, and perhaps for that reason, owing to the prize list being cut down, our exhibits were not as full as in some former years. We found by experience that very few of the western men were attracted by the amount we could give in prizes for pears, etc., to exhibit in Ottawa; therefore this year they struck off some of the prizes, but I believe they intend to bring the prize list back to its former standard. Our fair is largely an apple show, as regards the fruit exhibit. We do not grow as large

an assortment as they do here, but as far as quality goes, we have as good as any place in Canada. We think that our fruit tastes better, and it certainly is more highly colored. One advantage our fair has is that we always have a number of very fine exhibits from the Experimental Farm.

The American Pomological Society.

Mr. Race: There is not very much to report of the meeting of the Pomological Society of New York. My visit gave me a good deal of pride in our own Association, for I found that we were just as practical as they were. While I was there the chief discussion was the exhibit of apples at the Fall Fairs. It seems up to this time they had no particular number of apples to a plate, some would have perhaps four while others would run up to eight and ten. Our Association was referred to in the discussion, and our system of allowing five to the plate was considered and adopted by them.

G. C. Caston (Craighurst): I think we went there with a wrong idea of that meeting. The American Pomological Society is a very extensive concern, reaching over America, at least the United States and Canada, and a large part of the time was occupied in reading reports from different parts of the country all the way from Florida to Minnesota in regard to different fruits and their adaptability to those different localities, and of course the Florida and California fruits were principally citrus fruits that we were not much interested in. There was a very interesting discussion on the subject of bees fertilizing flowers, and an entire evening was given to the bee men, who were pretty well represented. One gentleman took up a great deal of time and said very little, but there was a scientific gentleman who gave some very practical addresses on the importance of insects, especially the honey bee, to fruit growers in fertilizing the blossoms of the fruit. One of the most important papers, to my mind, was the one given by our own Secretary on the export of North American fruits. Mr. Powell, who was with us last year, made an important point in the discussion of that paper, that in the export of fruit the quality is the first consideration. There is no doubt of that, and that we must begin in the orchard to produce that quality by the improved system of cultivation, spraying and paying attention to all the details of fruit culture, being ever and always at it to secure quality there. We knew that the State of New York was a great fruit state, the cultivation of important fruits having been begun there before they were here, and we were proud to know that New York was the only state that was ahead of us at the Pan-American. Well, I think we should give New York a little more credit than we are disposed to do on that account. In going from Niagara Falls to Buffalo I saw a great number of orchards, but I did not see a single apple. In going from Toronto to Niagara Falls there was a great scarcity of course on the Canadian side, just here and there a small sprinkling of apples, but from the Suspension Bridge to Buffalo I do not think I saw an apple, although I went over on the New York Central and returned on the Lehigh Valley. I also noticed that, after all the teaching of Prof. Bailey and other eminent men, a great deal of the soil was still in sod. I do not know whether that had anything to do with the barrenness, but nearly all the orchards, and some very large ones, were standing in tough sod. If that state of things exists largely over in New York State, I think they must have made a very creditable showing, taking all things into consideration. I think it is a mistake to send so many delegates to those meetings to represent our Society; I think two would be sufficient. We had a very pleasant time, and we found the Americans the most agreeable persons we could possibly meet. Some person has said that the Yankee is the most entertaining and pleasing companion you can possibly come across, because he will find out what you know, and he will tell you all he knows, and what you both don't know he will guess at. (Laughter.) However, that may be, we received every attention, and have nothing to complain of: in fact, we received so much kindness and courtesy as to fill us with the desire to go again at some future time.

Alexander McNeill: The Michigan Horticultural Society constituted me a delegate from this Association at two of their meetings, their summer meeting at Detroit and their fall meeting at Munroe, and I wish to put on record the fact that I never was more royally entertained, and have seldom attended more interesting meetings, and I feel like publicly expressing my hearty thanks to the fruit growers of Michigan for the welcome they gave to our Society through me.

The President: I have pleasure in calling on our Fruit Commissioner to the Pan-American, Mr. Bunting.

W. H. Bunting (St. Catharines): I looked forward with a great deal of pleasure to the meeting of the Pomological Society, and regretted very much that my duties prevented me from attending all the sessions. However, I had the pleasure of attending two, and I wish to corroborate what Mr. Race has said with reference to the comparison between our Ontario Society and the American one. While there was gathered there a very large galaxy of the professors from the different States and a large number of experts, yet I felt satisfied afterwards that the rank and file of the members of our Association in their meetings compared very favorably with the rank and file of the members who attended there, and after that meeting was over I had a much higher appreciation of our own Association than I ever had before. I was also extremely pleased to be instrumental in assisting a number of our fruit growers in presenting before the Society the claims of our fruit growing industry in a practical way, and it was with a great deal of pleasure that I heard the announcement of the awards that were made the last evening, where four of our members received recognition that they were justly entitled to. I am sure that this recognition was the more valuable from the fact that the exhibits made by our members were made specially for the American Pomological Society, and were independent of our general exhibit, and did not compete in any way with it. In a number of cases our exhibits before the Society were compelled to compete with the complete exhibits of the various states, which were entered for recognition and consideration by the Pomological Society, so that on that account I think the awards that came to our members were more valuable and of greater importance. At the close of the meeting I had the pleasure of suggesting that at some future time they should arrange to have their biennial meeting held at some suitable point in Ontario, and I felt sure that I voiced the feeling of our Association in suggesting that idea. It was an extreme pleasure to me to meet so many gentlemen of prominence and importance in connection with fruit growing throughout the States, and felt that it was a matter to be regretted that the unforunate circumstances which occurred just at that time prevented the gentlemen attending that meeting from taking cognizance severally as they would, no doubt, have done on the following Saturday, of the General Exhibit that we were at that time displaying for the Province of Ontario.

Quebec Pomological Society.

Mr. Harold Jones (Maitland): I attended the eighth annual meeting of the Quebec Pomological Society, held at Huntingdon, January 31st and February 1, 1901, as representative from this Association, and must say that although the Society is comparatively in its infancy it has done and is doing a wonderful amount of work, and is bringing to our knowledge the resources of the country in the growing of apples and plums that was a surprise to me and many other visitors at the meeting. I was particularly pleased to see the interest taken in the meetings, and the large attendance from the surrounding country. Farmers came to the meeting, anxious to learn, and asked questions and discussed subjects quite freely, which must have been very gratifying to the directors, when they had devoted so much time and thought to making the meeting educational and interesting. I endeavored to have the Society endorse the action of the Ontario Association in the Fruit Marks and Inspection Act, but there was very little interest taken, as there are practically no exporters among the growers, who look to Montreal City and local trade for the consumption of all

surplus fruit. Mr. R. B. Whyte, of Ottawa, explained some of the advantages of local Horticultural Societies affiliated with the Provincial Society, and the subject received favorable attention, and will no doubt be seriously considered by them when they realize the good work they are doing here in Ontario.

The report then went on to give a resume of the addresses delivered by Professors Waugh, Craig, Fletcher and Saunders, and said that the discussions were spirited and profitable. For a young society Mr. Jones considered the Quebec Society to be in a flourishing condition and well managed.

There is one thing that I would wish particularly to call attention to in this report, and that is, as to the reading course that Prof. Craig is conducting, under the control of the New York State Government. It is wonderful what an interest the people are taking in that course; it was first started as an experiment, but now has thousands of readers. It is one of the very best innovations that has ever been taken up for the education of the farmers, and I hope that our Provincial Government will be able to take up something of a similar kind for us in Ontario. It is not every farmer's son that is able to go to an agricultural college. If they get away for a few weeks from their homes, and finish their schooling, and get to a business college, that is about all they can do, but this reading course brings this knowledge right to their doors, and I believe to-day there are thousands in our Province that would take it up if they had the chance. I think that subject might well be discussed amongst us, and a recommendation placed before the notice of our Minister.

Prof. Waugh of Vermont was introduced, and after a little pleasantry about the annexing of Canada, said : One of the speakers has said that a large number of the Wilder medals were given to the Canadians. They belonged to the Canadian as much as anybody else, and everybody felt so. He said that there seemed to be no jealousy at all on the part of the fruit growers there, that a large number of the medals should come here. I am very sure that is true; in fact, I am sure they were delighted that Canadians took so much interest in the meeting, and made such a strong endeavor to be present and to exhibit their fruits, and show what they were doing in this line, and they were very glad indeed that such a recognition should go to them.

Prof. Macoun of the Experimental Farm, Ottawa, expressed his pleasure at being present, and said : We work a farm in a section of the country, which is very seriously handicapped on account of the severe winter, and on this account I am not able to carry on many experiments which are useful to you in more favored parts of the Province, but in coming to you I learn better the conditions, and in that way I can be more helpful to you, and if I can say anything that will help to make the meeting more interesting, or to impart information I shall be very happy to do so.

REPORT OF THE COMMITTEE ON NEW FRUITS.

The following report was presented by Prof. H. L. Hutt, Ontario Agricultural College, Guelph :

The object of this Committee on New Fruits is to take note of and report upon the new and seedling varieties of fruits which appear from time to time. The importance of such work may readily be seen from the fact that many of our most valuable varieties of fruits now under cultivation have been of chance origin. We are on the lookout, therefore, for anything new in the way of fruit which promises to be of value.

So far our attention has been confined almost entirely to seedlings of Canadian origin, and the large number of these already in cultivation is a subject worthy of note; but, at the suggestion of the meeting last year, we have made an effort to enlarge our field of work by taking note also of the new and promising varieties which may be brought forward by American growers. A circular explaining the nature of our work and soliciting their co-operation was sent out last September to many of

the prominent American introducers of new varieties in hopes that we might have something from them of interest to report at this meeting. From a few of those interested, particularly in the earlier fruits, we received replies, that it was too late for them to get samples this year, but from the majority we have still to hear. So that what fruits we have to report upon at present are all of Ontario origin.

Owing, no doubt, to this being somewhat of an off year for fruit, particularly for apples, there are fewer fruits to report this year than usual. What is of more importance, however, is that a number of them appear to be quite promising.

The following are those that have come to our notice during the past year :

Seedling Apples

No. 1. A very handsome winter apple received on Christmas Day last year from Mr. Brechon, 456 Dundas street, Toronto. In size and shape it is much like a large-sized Seek-no-further, but the color was that rich red and golden yellow of the King. The quality was excellent, and, if this is really a new variety, it is well worthy of propagation. Mr. Brechon says it was a seedling grown by an old gentleman, now dead, who was always experimenting in that line. We tried to get samples of this apple to show at this meeting, but have not had any reply so far to our letter asking for them.

No. 2. A showy winter apple, very much like Ben Davis, but of better quality. This apple was sent in by E. Leonard & Sons, Cobourg. Mr. Leonard says he has been handling apples for the last thirty years and feels confident that this is an improvement on Ben Davis, being as hardy and productive as that variety and of a better quality.

No. 3. An Algoma seedling, from Mr. John Pink, Millford Haven, St. Joseph's Island. This is rather an inferior apple, said to be a seedling from a Russet, but the smooth, greenish white skin and dull red cheek show little of that parentage. The flesh is as white as that of the Fameuse, but it is quite acid and of poor flavor. The tree is said to be hardy and productive, and the fruit a good keeper. These are qualities which our friends in Algoma are on the lookout for, but we think they will find them in other varieties of more attractive appearance and better quality than this one.

No. 4. A seedling apple, from Mr. T. W. Gibbs, Huntsville, Ont. Fruit roundish, conical, above medium in size; cavity, medium depth and width; stem short, moderately stout; basin narrow, medium depth, slightly wrinkled; calyx closed; color pale greenish yellow, splashed and washed with carmine; dots obscure; flesh white, tender, juicy, core medium; flavor sweet, pleasant; quality, good for a sweet apple; season, October.

No. 5. Seedling apple received from C. A. Cass, L'Original, Ont. Tree said to be very hardy and a vigorous grower; seedling of Fameuse, which it resembles in many particulars; third year of fruiting bore about three bushels of clean fruit. Fruit roundish, above medium size; cavity deep and of medium width; stem medium length, moderately stout; basin medium depth and width, wrinkled; calyx closed; color, pale yellow, almost covered with crimson, but a few patches were only streaked with it; dots moderately numerous, small, distinct, yellow; bloom rather heavy; flesh white tinged with red, crisp, juicy, sub-acid, pleasant, Fameuse-like flavor; quality, good ; season probably early to mid-September; promising.

No. 6. "Rufus Apple." from Miss J. Matheson, Perth, Ont. Originated in the garden of Lieut.-Colonel Matheson, M.P.P.. Perth, Ont., about seventy years ago. The tree is hardy and a very strong grower. Fruit roundish, conical; medium size; cavity narrow, medium depth, russetted; stem short, slender; basin narrow, shallow, slightly wrinkled; calyx closed; color pale yellow, well washed with crimson, dots numerous, pale yellow, distinct; flesh white tinged with pink almost to core, tender, juicy, sub-acid, pleasant flavor, skin moderately tough; quality good. Season mid-winter to late winter. Probably a seedling of Fameuse. Promising.

Seedling Pear

On October 23rd last we received from Mr. E. C. Beman, Newcastle, samples of a large showy pear resembling very much in shape and coloring the Sheldon. In reporting upon this pear we cannot do better than quote Mr. Beman's own words with reference to it. He says:

"I am sending you by this mail a box of seedling pears to examine and report upon. The tree has been bearing for three years, is apparently hardy, and is a vigorous grower. The form of the tree is somewhat like the Flemish Beauty, but a little more open. It is quite productive, with the fruit evenly distributed throughout the tree. A longer time will be required to decide upon its merits, but I am inclined to think it will prove a valuable market variety, being very large, handsome, of good quality and entirely free from spotting."

I can heartily endorse all Mr. Beman says of the large size and handsome appearance of this pear, but I thought the texture hardly as fine and the quality not quite so high as we would like to find in a new variety if it was to be added to the list of those now in cultivation, although I see that Mr. Woolverton in The Horticulturist speaks of it as "uncommonly large and the flesh fine and buttery." Mr. Macoun describes its flesh as "yellowish, juicy, sweet, tender melting; core small; quality good." It may have been that those I sampled were hardly in fit condition. In answer to a letter in reference to this point and asking for particulars as to origin, Mr. Beman gives the following additional interesting information :—

"About ten or eleven years ago I planted a quantity of pear seeds taken from windfalls of good varieties, such as Sheldon, Anjou, Flemish Beauty, etc.; in fact, anything I had that was not sound enough to pack. I planted out where other trees had died, probably two hundred or more of the seedlings of these, the most of which have commenced to bear, and this is the only promising one of the lot. The quality is not quite as good as I would like, but it is much better than that of many varieties considered first class for market.

"Being a chance seedling, it is, of course, impossible to say just what it is from, but, judging from its appearance, it might be a cross between the Sheldon and Clapp's Favorite. It has the granular flesh, and approaches the shape and time of ripening of the Sheldon, and it has also the abundant and slightly acid juice of the Clapp's Favorite."

This pear is certainly worth watching, and we hope to be able to test its quality more carefully next year.

Seedling Plums

Prof. W. T. Macoun, Central Experimental Farm, Ottawa, writes :—

"We have been growing a large number of seedling American plums here, but have discarded nearly all those which have fruited, as they were no better than the older varieties. Two very promising ones, however, were described in our report on new fruits last year, and this year there is one more, which I have named Caro. It is a seedling of Wolf, roundish; large to very large; suture fairly distinct, not depressed; color bright red showing yellow in patches, bloom light, dots numerous, yellow, distinct; skin thick, moderately tender; flesh deep yellow, juicy; stone large, outline oval, considerably flattened, clingstone, flavor sweet. rich. good, quality very good. A very promising seedling, more attractive than Wolf and better in quality. Sampled September 7th, 1901."

No 1, Seedling Peaches

On September 20th we received from Mr. A. E. Sherrington, Walkerton, samples of a fine, large, showy peach of the Crawford type. These averaged 2½ inches in diameter. The flesh was yellow, free from the stone, and of good quality.

The tree is young, just beginning to bear. Mr. Sherrington says it bore this year about half a basketful of fine peaches.

As hardiness is one of the qualities most desirable in the peach, if we are to extend the area over which it is grown in this Province, it is not at all unlikely that we may find just what is wanted in some of these northern-grown seedlings. This variety has certainly good appearance and fine quality, and, if it has any extra hardness, it is well worthy of propagation.

No. 2, The Rainbow Peach

Grown by Mr. D. Sare, London, Ont. A photograph and description of this peach is given in the November number of The Horticulturist, where the following account of its origin and qualities are given by Mr. Sare :—

"My wife and I bought some peaches when at Mackinac Island in August, 1897. My wife put two or three of the stones in her trunk, and, on our return home, I planted them. The following spring they grew, one of them more vigorous than the others. I gave this one particular attention as to pruning, etc., and have been rewarded this spring by seeing my tree well covered with bloom. The tree set about 100 peaches, which were thinned out to about thirty, and I harvested about twenty fine peaches, four of them weighing one pound six ounces and a half, and each measuring in diameter, as near as possible, three and a half inches. The rest of the peaches were all very fine, but not quite as large as these. The fruit is very fleshy, luscious, and has a very small free stone. The color is golden yellow inside, with pink markings. Finer peaches we have never eaten. I called them the Rainbow peaches, because their colors were so magnificent and beautifully blended, from a straw color to a purple."

Seedling Raspberries

Mr. R. B. Whyte, Ottawa, has raised quite a number of seedling red raspberries, one of which, formerly known as No. 17, now named Herbert, is proving to be of extra merit. It is under test at the Ontario Agricultural College, Guelph, also at the Central Experimental Farm, Ottawa, and at the State Experiment Station, Geneva, N.Y. At Guelph it fruited for the first time this year ,and, while not ahead of Shaffer and Columbian, it ranks near the head of the list among about 30 other varieties.

At Geneva, we are told, it headed their list this year for vigor and productiveness, and Prof. Macoun makes the following reference to it in the last number of The Canadian Horticulturist :

"Last winter raspberries suffered very much in this locality, as a result of which the crop this year was small. A seedling known as Herbert, which was originated several years ago by Mr. R. B. Whyte, of Ottawa, proved much hardier than most of the other varieties tested, and there was a good crop of it. It is hoped that this fine variety will soon be offered for sale, as it should prove a most desirable acquisition to the kinds now on the market. It is of the largest size, bright red, moderately firm, of good quality and very productive, and its hardines will make it especially valuable in the colder parts of the country."

In response to a request for particulars as to its origin and behavior at the home of its originator, Mr. Whyte has sent us the following :

"The Herbert is one of about 30 seedlings that I grew about 10 years ago. They all came from a mixed lot of seeds that were thrown into a henhouse in the garden. On removing the henhouse the next spring a large number of raspberry plants grew up. I selected the most promising and planted them for testing. On the first season's test I discarded all that were inferior to the best varieties, and in succeeding years all that were not superior to anything I had grown. I have now got down to three, No. 7, 13 and 17. No 13 is a grand berry in size and quality, but has the defect of growing very long fruiting branches, which are apt to break off with the weight of the fruit. No. 7 is better in all points than Cuthbert and Loudon, but does not bear the crop nor has it the vigor of No. 17. The good points of No. 17, the Herbert, are, first, its great vigor and hardiness. We have no berry that grows such strong, hardy canes; second, its productiveness. My family say it bears more than

twice as much as any other variety; third, its large size. There is no other variety larger, and very few as large. It is much larger, on the average on my ground, than Cuthbert and Loudon; fourth, quality is first rate, juicy and sweet, much nicer for table use than Loudon or Cuthbert."

H. L. HUTT.
W. T. MACOUN.
L. WOOLVERTON.

Robert Thompson (St. Catharines): What is the season of that new peach, the Rainbow?

Prof. Hutt: I don't know that Mr. Sayer mentions that. We have his account of it, and the photograph shown in the Horticulturist, but I will try to get the particulars for next year.

A. M. Smith (St. Catharines): What is the season for that one of Mr. Sherrington's?

Prof. Hutt: September 20th. That is a little later than the Crawford in your section.

Mr. Thompson: With regard to that first seedling apple of Mr. Brechon, it is very similar to the old-fashioned English Hubbardson.

Prof. Hutt: Yes, it had somewhat the appearance of the Hubbardson, but it struck me as being a somewhat larger apple and had the color more of the King.

Mr. Thompson: Mr. Brechon sent it over to Buffalo, and it was the Hubbardson he sent there, and the other apple was another old standard apple; there was only one that could not be named out of the three.

G. C. Caston (Craighurst): Do you mean to say that this new raspberry is better than the Cuthbert and more hardy?

Prof. Hutt: It is a new raspberry with the originator, and as Mr. Whyte and Prof. Macoun have propagated it for three or four years, I would like to hear Mr. Whyte on it. He is the father of it.

R. B. Whyte (Ottawa): I don't know that I can say more than I said in that letter I sent to Prof. Hutt. Mr. Macoun has it under different conditions from mine. As far as the hardiness is concerned I cannot tell, because I cover everything. I lay raspberries down. This past winter I have discarded Cuthberts altogether. I consider this new one very much hardier than the Golden Queen. Mr. Taylor told me at Geneva that for vigor and for crop it stood at the head of the list of all the varieties they had there, they have had it now for five or six years. I have it and the Loudon growing alongside in exactly the same state and condition, and it grows three times the bulk of wood the Loudon does, and bears three times the fruit. Our girls who do the picking say they do not want any other raspberry to pick, so I have discarded all raspberries except my own three seedlings of the Saba, and I have grown practically every raspberry that has been grown in this country Where space is valuable, as it is with me, it had the advantage over all others on account of the large crop.

Prof. Macoun: We have had this raspberry, No. 17, fruited for the last two years. Last year it yielded very well, and this year we liked it and Mr. Whyte's No. 7 better than any other varieties we had, and the only other varieties that yielded better were some of our own that were not as good in quality or size. This berry is a much better retail berry than a Cuthbert, though I don't know that it will ship better. The great advantage with us is that it is so much hardier than the other kinds. Last winter, alhough we bent down all our canes, as we always do, they were winter-killed, or almost so, while this hybrid came out all right.

Mr. Caston: Do they winter-kill after you bend them down?

Mr. Macoun: Yes.

Mr. Caston: There is one thing we want very badly, that is a raspberry of a better quality and a better bearer than the Cuthbert, and one that will stand in the northern sections without winter-killing, without losing so much bearing wood.

Mr. Boulter: Do you cut them back through the summer?

Mr. Caston: Yes, but in the open valley they will continue to grow till the snow comes.

Mr. Sherrington (Walkerton): I think that is the great fault with the Cuthbert. It grows too late, and the vines are too tender when the winter sets in.

W. A. Whitney (Iroquois): I think the most desirable fruit we can think of to-day is this raspberry, but it is tantalizing to us when we find we cannot get it. It is only in the hands of the colleges and Mr. Whyte. I would like to have it.

The President: Is anything being done in the way of propagating it for distribution?

Mr. Whyte: Well, I have quite a large number of plants. Several people have been negotiating with me. I am not in the business. I could distribute it in small quantities.

Mr. Sherrington: I should very much like to have a sample of it in my plot. I have some seventy varieties, and I would like to test it with the rest.

Mr. Whyte: I would have no objection.

The President: I should think some of our nursery men should take hold of this berry.

Mr. Caston: It would be well to have it tested first at the various experiment stations; if it is all that is claimed for it, it will be a valuable acquisition.

Mr. Boulter: That is what the experiment stations are for. We have things experimented on at Guelph, and we never see or hear of them, except at these meetings.

Prof. Hutt: Whenever we receive a new variety like that we are under obligation to keep it in restriction. It would not do to break faith with the originator by distributing it.

SAN JOSE SCALE.

By Geo. E. Fisher, San Jose Inspector, Freeman.

At the last meeting of this Association at Brantford I think we talked considerably about the life history and habits of the scale. On this account I think you will probably prefer to hear something of the development of the scale in the Province, and the condition at the present time, and what is being done to control it, and the results. It affords me indeed very much pleasure to say to you that the scale has developed at very few new points—(Hear, hear)—in a surprisingly few; and I think this reflects much credit upon our early work. This is encouraging, especially as there is a feeling of alarm going through the country, and the people seem to be anxious about the scale, and we think that if it were turning up at new points we would hear from them, and there would be samples sent in. There are samples of other scales sent in, and I am disappointed to find that the people throughout the country are so ignorant of the appearance of the San Jose Scale upon the wood. If we could devise some means for distributing the information of this, it would be very useful indeed, as it would enable people to detect the scale more quickly upon its coming among them. The samples that are sent in are mostly red plum scale, oyster shell bark louse, scurfy bark louse (Aspidiotus Ostraformis), and a few similar scales, samples of which I have here, as well as samples of the genuine article. They are not alive at this time of year; there is no movement now.

The Secretary: Would they not come alive in this warm room?

Mr. Fisher: I think not, they have been pretty well frozen, and I cut them last night by the light of the moon. (Laughter.) Now, while this seems to be the condition of the country generally, I must say to you that in the old centres of infestation, where the scale was first found, the multiplication and distribution and the destructiveness of the scale is greater than ever before; in fact, in those places it is really alarming. In order to enable you to understand something of the situation I

might say that in several orchards that have been closely observed by me all the way along, in which we found very little scale in 1899, in fact, it was difficult to find—in 1900 the scale could be found on any tree, and almost any twig. In most cases the orchard bore full crops of good fruit in 1900. There were peaches on some of these orchards this year, and I took them off and ate them myself from trees that are dead now from the attack. The scale has sucked them out since the crop was taken off. There are trees of all kinds that have been killed by the scale; not only peach trees, but plum trees and pear trees, and even apple trees. It was originally supposed that the apple trees, being more resistive, would be sufficiently so not to be injured by the scale, but this we find to have been a mistake. The apple orchards, if seriously attacked, will succumb. There are many instances of this. There is no longer a lack of evidence of the destructiveness of the scale, and those wishing to get information on this matter can satisfy themselves by visiting an infested section, for the scale at those points has asserted itself, and has demonstrated by actual work the worst that has ever been said of it. Now with this evidence before their eyes, the people of these sections have materially changed their feelings in regard to the scale. Some of them, even now, fail to recognize it as a dangerous enemy, but the majority of those whose interests are large, feel that the scale is among them, and that it is here to stay, and that they have to do something, and that they must do it at once, and they are anxiously inquiring what to do.

I had the pleasure of a visit from Prof. Webster, State Entomologist of Ohio, who came last summer to spend a week with me at my home in Burlington, and during that week we visited a number of points, and it was a great satisfaction to me when he told me that we were making more progress in our investigations here than he knew of elsewhere. (Hear, hear.) We have been trying a number of experiments, some of which are very promising indeed, and at his request, and with the permission of the Minister, I went with him over his work in Ohio, beginning on the south shore of Lake Erie at Mentor, a short distance east of Cleveland. We visited four points, one at Mentor, one at Lakeside, again at Catawba Island, and then a few miles north of Toledo; and the impression gained from these visits are that the scale in Ohio is identical with the scale here, and that is my conclusion from visits farther south at New Jersey, Delaware, Maryland and Virginia. I have found San Jose Scale wherever it was to be found, and the behavior of the scale under treatment, and that of the trees, is much the same there as here. The lessons learned were principally corroborative, and useful in proving my previous conclusions; but they have been operating against the scale there longer than we have; they recognize the necessity, for they say the scale has been among them a little longer, perhaps, and the people are more alive to the necessity for this. They have seen orchards go down before their eyes, and they realize that unless they prosecute a fight vigorously fruit growing with them is a thing of the past, as it certainly is here where the scale has taken possession of a section. The people must either fight the scale or give up the business.

In the spring of 1901 there was a considerably larger quantity of spraying material distributed than in 1900. The Minister of Agriculture has very kindly assisted the people in this matter by furnishing whale oil, soap and crude petroleum at one-half what it costs, to whoever would apply for it, to use against the San Jose Scale. There is a difficulty in getting this soap and oil; those who have undertaken to get the oil themselves have not been successful, because the oil people did not care to be bothered with small orders, but it was furnished in considerable quantity, and we succeeded in getting what I believe to be the best oil that this country affords, that is, the lighest oil. The gravity of the oil used was 39½, and on account of a lighter oil being recognized by some in the United States it was thought desirable to use a quantity of Pennsylvania oil, which upon its arrival was tested and found to have a gravity of 44½, which is five points lighter. The people used this material on their trees with greatly varying results, which results seemed to be in keeping with the way in which the material was used. A large quantity of ma-

terial is not necessary, but every part of the tree must be reached, and where thoroughness and care were exercised in applying the remedies the results are very encouraging indeed.

We conducted quite a variety of experiments during the year. We used the Ohio oil and the Ontario oil, both diluted and undiluted. We used three samples of whale oil soap. We used a combination of soap and oil, we also used the celebrated California wash of lime, salt and sulphur, and at the request of Mr. J. H. Fairbank, of Petrolea, who supplied the material, we treated a row of trees with the water that is pumped up with the oil. The water is mineral, and Mr. Fairbank reasoned that it might be effective in destroying the scale and he was so much interested in the matter that he put up a couple of barrels and sent them out at his own expense. Besides that, we poisoned some trees at the request of a gentleman in Waterford, and we also imported parasites from Maryland, and fumigated the trees, that is the list of our spraying experiments.

Now as to the results derived from these experiments. The American oil and the Canadian oil applied undiluted, killed all the trees that were treated with it. There seems to be a difficulty in treating a tree with a sufficiently small quantity of undiluted or crude petroleum to cover the tree and use little enough oil not to injure it. We have discussed it very frequently among ourselves, and our conclusion was that not more than a quart of oil should be used on a tree of the size of an ordinary full-grown peach tree. When I speak of a tree, that is the size I mean, that is our standard. The understanding was that not more than a quart of oil should be used to a tree, but the men claimed that they could not cover the tree with a quart of oil with the ordinary nozzle, and they used two quarts undiluted. We found that the ordinary nozzle was too coarse for using such spraying material, but since then we have had made nozzles having very much smaller openings. The nozzle furnished by the pump people, the coarse one, is 14 to the inch, and the next 20 to the inch, and I have had nozzles made down to 66 to the inch, the nozzle having an opening 1-66 of an inch. That seems a very small opening, but with a good pump it will work; there will be no clogging, and you can have a nozzle with an opening anywhere down to that size, and it is not possible to put out a barrel of material in a day with a nozzle of that size. So you recognize how slowly it gets away from you. With the larger sized openings the material gets away from you so rapidly that you get too much on the tree before you know it. There was a row treated with American oil, 20 per cent. with 80 per cent. of water, and another row treated with Canadian oil in the same proportion. We found that the scale was destroyed at first a little better on the trees treated with Canadian oil than on those treated with American oil. and also that the trees treated with Canadian oil had a covering remaining throughout the season. while the trees treated with American oil lost their covering, the oil evaporated, and did not furnish this protection any longer than perhaps half of the season. The American oil being lighter is less likely to injure the trees, but it did not destroy the scale as well. The Canadian oil will destroy the scale, and it is somewhat more injurious to the trees than the American oil.

We found that the effect of the soap was to reduce the severity of the oil treatment. A pound of soup and a gallon of water used with 25 per cent. of oil will not injure a peach tree, neither will it destroy the scale as well as 15 per cent. of oil with the soap. We found that it is necessary to work out a formula. We must find what quantity of soap is necessary to correct the severity of the oil treatment, just enough to kill the scale without injuring the tree. We have some splendid illustrations of the usefulness of this mixture. I know of several instances where oil and soap have been combined and the scale has been destroyed, and the peach trees are not injured in the least. With regard to the soap, I like it very much. It is a splendid remedy, providing the soap is good and enough of it is used. It is expensive, and the tendency is to use too little in the mixture, and to use too little mixture on the trees, but if the soap were not so expensive I would like it better than anything else on peach trees. On encrusted trees there seems to be a difficulty in getting at

the live scale through so much cover, and in order to reach it we have found that a second spraying is very desirable in effect. We treat the trees thoroughly and let the soap soak until the outside begins to dry a little, and then make the second application. The first application is a preparation for the second, and the scale beneath the cover is reached and destroyed by this second application. That is unnecessary except in cases of encrustation.

The lime, salt and sulphur mixture has been spoken of by a great many, but it has been said by those who were supposed to know that it would not serve a good purpose in this climate on account of the great rainfall. In California they use it, and almost nothing else. They have abandoned fumigation in some portions of California for lime, salt and sulphur, and they feel comfortable in regard to the scale, having the results that they get from the lime, salt and sulphur. I may say that I have not visited the infested districts in California, but I understand that this is not universal. California is 800 miles long, and they are using lime, salt and sulphur in certain parts, and in other parts they are fumigating. The parasite does not work in California. Last spring we got some lime and salt and sulphur and boiled it and put it on a row of 15 full-grown peach trees. You remember how it rained in May ? We got that mixture on just before the rain began, and perhaps the wettest May followed that the present generation has ever known, but the mixture remained on the trees surprisingly. I thought that the drenching rains would certainly wash it off, but they did not, and the effect on the trees seemed simply magical in cleaning them up. I think that not too much has been claimed for soap. It cleans up the trees and invigorates them and improves the orchard very much indeed, but lime, salt and sulphur is as far ahead of soap in this particular as soap is ahead of other treatment.

Mr. Boulter : What proportion of those do you use?

Mr. Fisher : The proportion I would use would be 33 lbs. of lime, 15 lbs. of salt and 15 lbs. of sulphur, with water enough added to make 30 gallons of mixture. This must be boiled for two or three hours. Boil it that long, and boil it hard, and put it on hot. Now I do not wish to be understood as speaking positively about this treatment. We know very little about it, but the little that we do know is so enouraging that I would like as many to try it as will. In fact I would like the people to assist us in making experiments, and I found that where they do we get some splendid information from the people. Put it on with a spray pump.

W. H. Bunting (St. Catharines) : In three hours you would boil away a large quantity of water.

Mr. Fisher : Don't do your measuring till you get through boiling for that matter; add the water at the close. Now the poisoning we did was without any result at all. The poison dissolved, but it did not seem to affect the tree, and the scale developed and occupied the tree just as much as if nothing had been done. Mineral water was thoroughly applied, but it did not do a bit of good. The scale looks to me to be just a little bit plumper and fresher on these trees than any others. It certainly did not affect it any—not disastrously. The parasites I brought in from Maryland have, so far as I know, not developed, but I want to make some further examinations before I say that they have not. I did find one scale in which there were five black lines that I did not understand. I would like to look into that matter a little more closely before I say anything more about it. The male insect is about the size of the male scale, but it has two wings, and down in Carolina they claim that it is useful. I had a bundle of twigs that were sent over here, that we tied in scale-infested trees, and I hoped that the parasite would develop in the wad that was brought over and get over to the scale in the trees ; I do not know of a better way to accomplish this than the way that was undertaken. In some instances I put potatoes on each end of the wad that I tied to the trees, hoping to keep it fresh a little longer, but they tell me that was scarcely necessary.

Mr. Caston: Do they burrow into the scales and destroy the young insects there?

Mr. Fisher: Well, we hoped for that, that the insects would devour the scale. We made other experiments, that is, with hydrocyanic acid gas. We got a tent and used the gas on a good many trees. Over 300 trees were fumigated with splendid results. We cannot find a live scale on those trees, which is very gratifying indeed. It costs a little more, but the results are so entirely satisfactory that the cost does not seem to cut much of a figure. The cost of these various remedies is as follows: Whale-oil soap, about 12c per tree; crude petroleum, 2c per tree; combination of soap and whale-oil, from 3c to 5c per tree, according to proportions you use; lime, salt and suplhur, 2c per tree; fumigation, from 16c to 18c for chemicals per tree.

The tent appeared to be not very durable, and the equipment is certainly expensive. The time occupied in treating an orchard by fumigation with a sufficient equipment would not exceed what would be required to give it a thorough spraying. I think three or four men would fumigate probably 200 trees a day. and I would expect, if the work were carefully done, that the scale would be all killed, from such results as we have obtained, but authorities in California say that they have not succeeded in doing this. We cannot find scale on the trees that we fumigated. I treated fifteen trees at Niagara, and we ran out of chemicals. I went down to the druggist at Niagara, and he said he had some cyanide and sulphuric acid, but it had been in the store so long that he could not say anything about it, and was afraid it would not be very good. He had just enough for one tree, and I used it. The tree that was treated with those chemicals was the only tree on which we could find live scale at the present time, and this goes to show the necessity of having chemicals right. On the other fourteen trees we have not been able to find any scale remaining alive; and I have sent samples of branches from these trees to different points in the United States, and some were sent to Prof. Fletcher at Ottawa, and also samples taken to the meeting of the Entomological Society at London, and in no case has a live scale been found on these branches.

Mr. Race: Why should the tents be so expensive? What are they made of, and how long do they last?

Mr. Fisher: We do not know very much about the lasting quality of them. The tent that I had is made on a frame, called a box tent, and it has a hood. The frame is 5x5 by seven feet high, and then on top of this there is a hood. The base of the hood is the size of the tent, 5x5, and it goes up six feet above the frame, and then there is a square patch a foot and a half in the top, so that we can fumigate a tree thirteen feet high, and for a tree the form of a pear tree, we can take a rope and rope in the limbs a little, and thus get a pretty good-sized tree into that tent. The hood is the size of the tent at the bottom, 5 x 5.

Mr. Race: Why should not the tent be durable?

Mr. Fisher: Simply because we find it is not durable. We find the tent that was made in the summer is failing, it seems to be giving out, it tears easily. It is made of ten-ounce stuff, first class, good material, and painted with lamp black and linseed oil, which is recommended by those who have done this work, and I don't know anything else that would rot it except the gas. Mr. Randall, of Niagara, thinks it will destroy the tent, but I think we made a mistake in putting the mixture on the outside, instead of the inside, and we will try it again and paint it on the inside.

Mr. Tweddle: Do not these tents burn as you roll them up and put them away?

Mr. Fisher: This tent, being on a frame, does not allow of being rolled up and put away, and that is one inconvenience—they require a great deal of storage, but the results are no doubt good. However, 5 x 5 would not be sufficient for a full-grown tree. The chemicals for a full-grown peach tree would be 16c or 18c, whereas the cost of chemicals for this tent that we used was only 5c. You will understand from that how much larger the tent will require to be for a peach tree.

Mr. Thompson: Do you think it would be practicable to treat an orchard that was six or seven years old?

Mr. Fisher : I think it would be entirely practicable in every respect, if the tents would last; that is the only question at issue with me. If we can depend on our tents we can destroy scale in that way, chemically, because you destroy them so completely. It is a great consideration to destroy that last scale, the one that remains to reinfest the tree, and where fumigation is properly done the margin left is so very narrow that I am satisfied that the trees would not be reoccupied for a number of years, at least for two or three. In regard to the use of crude petroleum, we find it more destructive to insect life than any other remedy that has yet been used ; and for this reason, and it being cheap, it may be recommended for the destruction of the San Jose Scale on all trees that will withstand it. Apples, pears and plums appear to be able to resist crude petroleum when it is used with care, and the Japan plums and the egg varieties appear to be the only ones that require to be treated with especial care. Another advantage of crude petroleum over other remedies is that it remains upon the bark of the trees and protects them from reattack during that season. The Canadian oil, or heavier oil, is considered to be more generally useful than the lighter American oil, and there would be no risk in using that on apples, pears and plums. The difficulty has been with the peaches, and that seems to be the difficulty now. The margin between what the tree will withstand and what is necessary to destroy the scale is very much narrower in peaches than in any other fruits, consequently greater care must be exercised in treating peaches. For apples, pears and plums, I recommend the use of crude petroleum to keep it in check, and for the destruction of the San Jose Scale. For peaches I recommend whale-oil soap. Now whale-oil soap, unless it is used of full strength, and used liberally, will not destroy enough scale on badly infested trees to make even a satisfactory job. It must be good soap, and it must be mixed at full strength of 2½ pounds to an imperial gallon of water, and it must be applied liberally so that every part of the tree is saturated in order to be effective, and when a tree is encrusted, I think it desirable to first treat the tree and let it stand until it becomes a little dry on the outside, and then give it another treatment, and you are pretty sure to have a satisfactory result. The soap seems to be a little too expensive to suit most people; that is the only objection to it. If the soap were furnished to me at a price that would make it as cheap to use as crude petroleum, I would like to use it very much, but it costs nearly six times as much as crude petroleum. It remains to be learned whether lime, salt and sulphur will be as useful as the other remedies for destroying the scale. If it should be, then it is to be recommended for use on peach trees, not only because of its insecticide effect, but because it is an active fungicide. We recommend crude petroleum for apples, pears and plums, and whale oil soap for peaches, until such time as we know more about it. You are quite safe in using these remedies, and they can be used to advantage and profitably used. We propose carrying on some experimental work during the winter. I feel that we are scarcely through with crude petroleum, although we feel pretty well satisfied as to the effect of it. It is recommended to be used in April, and its use then seems to occupy time that people would prefer to devote to other work, and our aim during the winter will be to determine whether or not crude petroleum may be used at an earlier date. And the same in regard to lime, salt and sulphur, and also in regard to fumigation. Our results from fumigation were very satisfactory indeed, but the work was all performed while the scale was active. As I understand it, the destruction is akin to strangulation, and it does not seem to me that the effect will be nearly so good if the fumigation is done while the scale is dormant.

A. M. Smith : Is there any danger of injuring the foliage by fumigating while the scale is active ?

Mr. Fisher : The scale is active, we will say, from any time in March, or the beginning of April, on till the opening of the bud, and there would be no foliage at that time. We did some fumigating in the fall of the year, when the trees still had foliage, and it was done in the night and with a slightly less proportion of cyanide. For trees that were without foliage we used a quarter of a gramme to the cubic foot, and for trees that had foliage we used a fifth of a gramme of the cyanide. We made that difference between trees that were with and without foliage. We did no injury to the

foliage with the fifth of the gramme of cyanide to the cubic foot enclosed. We inteud also to determine the quantity of soap to be used in combination with oil, so as to make that useful on peach trees. I would like as many of you as will to assist me in this work, or in other experiments that may be suggested to your mind. There is no reason why the fruit grower should not work out a remedy for this scale, or a remedy that will be generally useful, just as well as anybody else, and if he has the appliances—a pump and a good head—he can go on and bring this into a practicable condition and report to me or somebody else, and let the country have the beuefit. (Applause.)

Mr. Boulter : How far east have you found the scale ?

Mr. Fisher : Well, at a good many points in the neighborhood of Belleville.

Mr. Boulter : You never found any in Manitoba ?

Mr. Fisher : Yes, in different parts.

Mr. Boulter : Are you perfectly satisfied in your own mind that you have about the right remedy to stop it, with persistent work, without cutting the trees down ?

Mr. Fisher : I think perhaps I should have spoken to that question a little more plainly. I do not wish to leave any wrong impression with this audience. I think that it is quite impossible to eradicate the scale in any case. That will never be done. You will reduce the scale to a narrow margin, and you will hold it in check, so that you can keep your trees just as long as you fight the scale, but if you neglect it for a year or two the conditions will become as bad as ever; therefore it will not do to neglect it at all. The treating should be done regularly from year to year, and what fumigation will do, I really don't know. That is more hopeful than anything else. The only reliable way for annihilating the scale is by fire, and where distribution has not taken place, I would certainly recommend that any scale found should be promptly destroyed by burning. No one can afford to trifle with the scale. If they have had it in their control, as they would have in newly planted trees, there should be no hesitation in burning it under those conditions. Burn the whole tree, and, more, burn anything that is exposed to infestation. Get rid of it by burning; do not hesitate at all. The scale is worse than I can tell you of. It has demonstrated this year the very worst that has ever been said of it.

Mr. Boulter : They say experience is a good school, but the tuition is a little high. We all recollect what ideas went out from this Fruit Growers' Association, and how the Government took action in burning and destroying and digging out a lot of trees, but they are not doing it now. I was about three or four weeks in California, right at Monterey, the San Jose county, where the scale is supposed to have originated. I was talking to a very intelligent Englishman who had lived here for thirty years, a member of the California Fruit Growers' Association, and I sent our Secretary the report given by him to me, and I talked pretty seriously over this scale business. I said to him, "Mr. Burwick, you are right here, infested with it, as you say. Do you consider it necessary to dig these trees up and destroy them, to keep growing peaches?" He replied, "Why, we don't think of digging up trees and burning them." He took me out to his large peach orchard. "Of course you can see trees there that are infested with it." I asked him, "Are you losing anything by it in the quantity of peaches you grow?" He replied, "No." I asked, "Is the general consensus of opinion that you ought to destroy those trees to get rid of it?" He replied, "No." They fight with it, as you say, by the application of the remedies you suggest, and varnish, if I recollect right. I saw lots of trees there, and there was another insect, larger than the San Jose Scale was, and consequently had a little smaller name, which I cannot recollect. However, my opinion was this, that the Government now, no doubt, is doing about right in trying to stop the spread of this by the processes that we are engaged in, but it did look pretty radical to go to work and destroy the trees ; and when you say, burn them, I do not believe in that. I candidly stand up here and tell you to your face, I don't believe it is necessary to burn the trees to get rid of the scale. I believe science to-day can get over the difficulty, after what I saw in California, to get rid of that scale. It looks pretty serious, after a man has put out an orchard, after a great deal of difficulty and trouble, and after waiting years, to go to work and destroy all his trees. I have

been very much interested in Mr. Fisher's address, and I believe he is a pretty thorough man, a man who can sucecssfully ship his stuff over to Britain without Government help, and make more money than those fellows that are shipping with Government help. I believe he will succeed, and I believe he will do good, but I don't believe in fighting with fire and burning up the trees.

R. G. Way : Is it the same kind of a scale in California as we have here ?

Mr. Boulter : It is a black scale.

Mr. Fisher : The black scale infests the oranges and lemons; but the San Jose Scale infests their prunes and apricots. In regard to Mr. Boulter's remarks I would like to say a word. In the beginning it was intimated that there was not much scale in this country, and, assuming that, the Government set out to destroy it by burning it. As the work went on, we found it more and more, and we found it impracticable to destroy it in that way ; but, considering the nature of the insect, and how very, very difficult it is to handle, if it could have been destroyed by burning, as was undertaken in the beginning, it would have been worth a very great sacrifice to do it. I would urge upon the people, if they find isolated cases of infestation, and it is at all practicable, to burn out the scale, to do it without any hesitation. (Hear, hear, and a voice, "That is right.") If the scale is widely distributed, then you will have to resort to some other way.

Mr. Boulter : Would it not be better to send for you to go and examine it and see if it was the scale ?

Mr. Fisher : Well, I would do it if it were my own orchard.

Mr. McNeill (Walkerville) : How far north does the scale exist.

Mr. Fisher : Guelph and Belleville are the points farthest north where we have found it, but I am well acquainted with a professor in the United States who says that he found the scale wintering successfully in St. Paul. Well, I have been at St. Paul when the mercury was 40 degrees below zero, and I fancy that it stands at that a good part of the winter, and if the scale can winter successfully there, at St. Paul, it will winter successfully anywhere where fruit trees will grow, and that is the opinion which Prof. Webster expressed to me recently.

Mr. Boulter : I suppose the experiments will be continued on, this summer.

Mr. Fisher : They will, this winter.

RESOLUTION RE SAN JOSE SCALE.

Moved by M. Pettit, Winona, seconded by Thos. Beall, Lindsay, and resolved, that, in view of the fact that the San Jose Scale Act is not being enforced; and that in many fruit growing sections where the interests are large, and very little of any of the scale exists, it is desirable that the growers have Government assistance to protect themselves against this pest; be it therefore resolved that the San Jose Scale Committee be authorized to urge upon the Government the importance of enacting permissive legislation on the lines of the following memo :

1. It shall be a punishable offence for anyone to neglect to eradicate the San Jose Scale at once when it is located either by the owner and inspector or anyone else, and brought to his attention :

(a) By burning the infested tree.

(b) By fumigation with hydrocyanic gas.

(c) By thoroughly spraying with crude petroleum.

(b) Or other means approved of by the Department or its officers from time to time.

2. Any township must, on the petition of fifteen ratepayers, appoint an Inspector or Inspectors, whose duties shall be to thoroughly inspect all fruit trees, etc.. subject to San Jose Scale in the township, and see that the scale is eradicated where discovered.

3. The Inspector shall be paid one-third by the township and the balance by the Province.

4. Said Inspector shall be liable to fine for neglect.

5. The Provincial Inspector shall supervise the township Inspectors, direct them, and see that they are doing their work in the most effective and economical manner, that they make thorough inspections and that they secure the carrying out of the law.

6. The Government shall supply suitable material for spraying, on the same terms as in 1901.

Mr. Pettit, in moving the resolution, said : In allowing permissive legislation like this to be enacted, it is simply in accordance wtih the "Black Knot," "Yellows," and "Codling Moth" Act, and could be enforced very much on the same lines. It is a very great hardship in some parts of this country where there is so much invested in fruit-growing industry to think that one man, who would have perhaps the same opinion as my friend, Boulter, that the trees should not be destroyed or burnt, should cause his neighbors to suffer year after year, and be obliged to spray and destroy the trees, and be put to all this expense and inconvenience simply because one man will not comply with what, in all reason, would be justice ; and it is no great hardship, if a municipality adopts it, for that municipality to carry it out. Municipal officers are responsible to their electors once a year, and there would be no great hardship inflicted on any person.

Mr. Boulter : I do not wish to say that a tree should not be burned. I wish to say that this Association, established a great many years ago, and managed a long while before I came into it, by broad, scientific minds, doing something for the fruit growers of this country, should find some suitable remedy to eradicate this scale without destroying a man's property. Your ideas are right in that motion, that if a man is obstinate and will not listen to reason and have the remedy applied, then of course he should not have that tree left there.

M. Pettit : The best scientific men in the United States have been working on this problem for several years, and they are arriving at the same conclusions that Mr. Fisher has given you here to-day that it cannot be eradicated by spraying, as it is almost impossible to do it thoroughly enough to eradicate it.

Mr. Boulter : That is what your motion is for, that is to get Government intervention and supplement it with Township Councils, and so on, and, as you say, with fifteen men to put the machinery in force. My idea is, that we should persistently keep on experimenting. Mr. Fisher has told us of half a dozen different lotions by which he thinks the work can be successfully performed and save the tree. You know that the doctors of the Old School, when a fellow's finger got sore, sometimes cut the whole arm right off. They don't do it now. My theory is, that prevention is better than to cut and destroy it, if we can eradicate it by some of the up-to-date ideas that we have at present. I believe that the Government is doing a good thing, and that motion of yours tends in that way, that they should endeavor to continue to eradicate it by such remedies as Mr. Fisher has explained. I had not heard that the scale was found as far east as Belleville. This morning I asked Mr. Dempsey, who has charge of the experimenting station at Trenton, if he had heard of it or seen it, and he said no.

E. D. Smith, M.P. (Winona) : Mr. Pettit's resolution was a pretty long one, and I don't think Mr. Boulter was able to follow the meaning of it all through, else he would have noticed that, if the law is enacted, it means that everyone must keep his own premises clean of the scale. He may do it by any means he likes; he may fumigate, or he may spray, or take any other means to stamp it out, but if he does not get rid of it, and leaves it there as a pest to be distributed among his neighbors, involving the loss of thousands of dollars to them, he may be compelled to do so. Our attention was drawn to this very strongly because two of our neighbors went down into the district that is infested by the scale, and brought back such a report of its frightful progress. One gentleman told of an orchard that he had investigated two years ago, where, after some thirty or forty days' inspection by competent inspectors, only eighty-seven infested trees were found, and they only with a very little scale on, and they were taken out and burned, and the orchard was supposed to be absolutely clean of the scale two years ago. He went down this fall and found 1,600 peach trees in full bearing, but he said he would

not give $25 for the whole orchard. He said they were dead, or as good as dead. That alarmed us, and ought to alarm the whole country, so that some action should be taken. It seems monstrous that one man should be allowed to spread a pest like this all over his neighbor's orchard. We have laws on our statute books with regard to the Yellows and the Black Knot, and they have been enforced by some Townships, and the Black Knot and the Yellows have been cleaned out. Now this is ten times more dangerous than those were, and it seems to us that some action should be taken, and we ask that the Government supplement the grant from the Township, because the inspection of the San Jose Scale would be much more expensive than for the Black Knot, and the Yellows, and we thought that the Township Council might be loth to expend a sufficient sum to thoroughly inspect a Township like this, where fruit-growing is carried on in a large way. I sincerely trust that the support coming from this Association will be given to the Minister. We have always found the Hon. Minister of Agriculture to be very anxious to assist the fruit-growing industry in this matter, as well as in others; but he needs backing; he needs his arm to be strengthened by just such an Association as this. A resolution coming from the Fruit-Growers' Association will give him that backing that he would like, I am sure.

Mr. Pettit's resolution was then put and carried.

REPORT OF COMMITTEE ON FRUIT BASKETS.

By E. D. Smith, M.P., Winona.

You will remember that a year ago, at the annual meeting, I had the honor to move that a committee be appointed to arrange for standard sizes for fruit baskets, and pointed out that up to that time we were laboring under the great disadvantage that we had no standard fruit baskets. We have standard for almost everything else—for a bundle of hay, even—and for the measurement of almost every commodity, but we have no standards for the measurement of fruits, and consequently we have all kinds of baskets. The basket that was supposed to contain twelve quarts, and was a convenient size for peaches and plums, had gradually dwindled down to ten quarts, and anyone could see the injustice of that to the man that stuck to the old twelve quart, or to the consumer who bought the ten quart, thinking it was twelve quarts he was getting. Similarly, the grape basket held ten pounds of grapes originally, and it was sold by weight, and nobody proposed a smaller one, but finally it became more convenient to sell by the basket than by the pound, and they were called grape baskets. Subsequently some one built a basket that would hold nine pounds, and it gradually got down as low as eight and eight-and-a-half-pounds. So with strawberry baskets, although with strawberry baskets there was no great innovation. They were made by the thousand annually, and out of six baskets there would be four or five different patterns being made, and that would have gone on and gradually got as bad as the peaches. The committee appointed by this Association met at Grimsby, and adopted six different sizes of baskets, two for strawberries, and four for other fruits. The strawberry box was to contain 4-5 of an Imperial quart, that is, equal to the Winchester quart, and practically the size of box used by all the factories in Canada, except where some few cases have been made and called "sharks," a little smaller than the ordinary. The object of the Act was to stop that. In all cases the sizes were adapted as nearly as possible to those that were most commonly in use.

Mr. Boulter : About what weight of strawberries would that box hold ?

Mr. Smith : I could not say ; it holds four-fifths of an Imperial quart. Then a half of that, two-fifths of a quart is the pint box. That is a basket that is not used in Canada much, but it is used in the United States a good deal, and we thought somebody would want to use it. Then for the other fruits there would be four baskets. The one holding fifteen quarts or more would be a basket for wine grapes, and it was made fifteen

quarts or more, so as to not interfere any more than necessary with market baskets, or with people who want to bring in peaches from the United States in bushels, such as canning factories. Then, below that is the eleven-quart size, and 5¾ inches deep, perpendicular inside measurement, as nearly exact as possible. Now our old basket that was originally twelve quarts got down so that, after getting samples from a number of factories, I found four different sizes that were called twelve quarts, and the largest of them held 11½, so that your Committee, after a good deal of discussion, determined on a basket that would hold exactly eleven quarts, this being nearly as large as the largest basket that is in the country to-day, and that depth was fixed on because it fits three layers of ordinary peaches—not selected or choice, or extra peaches, but what will ordinarily go in commerce as first-class, that is to say, the better half of the crop, as a rule. Some size and some depth had to be adopted that would fit best for peaches, and after trying different depths, and getting the experience of different men for packing, this size was agreed upon. The next size gave us more difficulty. We had the grape basket, which was supposed to hold ten pounds; we had the six-quart basket; we had the ten-quart basket that holds nine pounds, and there were some between these. Some were used for peaches, some for plums, and some for grapes. We thought if we could strike a small basket that would answer all these purposes it would simplify matters wonderfully. The reason for simplifying was that, if we could reduce the number of sizes, they would pack more easily in a car. There is a great deal of business done in that way now, and will be more in the future. If a shipper goes to pack a number of baskets that are different sizes, he will find a great deal of difficulty. We could not get a size that would hold ten pounds of grapes that would fit with select peaches. The object was to get a basket two layers deep of extra-choice peaches. We could not get it to hold ten pounds of grapes unless we made it too long and too wide to look well, so we decided on a basket that would hold nine pounds of grapes, and it will hold two layers of fancy peaches, will answer for other fruits such as cherries, and make an excellent basket for cherries. Then, there still remained another size, that is for a small grape basket. That basket is now coming in the United States to supplant the ten-pound basket almost entirely. A gentleman told me not long ago that he did not believe there were 100,000 ten-pound baskets made in the State of New York now, that this basket was used almost exclusively; and I presume we will find, as the years go by, that this basket will be almost exclusively used, that holds 2 2-5 quarts, about three pounds of grapes, gross. When these sizes were decided on, meetings were called in different districts, one at St. Catharines, one at Winona, and one at Fruitland, and these meetings agreed, I think unanimously, on those sizes of baskets. This matter came up in the House of Commons, and I had the honor of introducing it, and found very little opposition. The only opposition we got anywhere in the country was from a few merchants. The representatives from Manitoba had been urged by some wholesale merchants in Winnipeg to oppose it on the ground that it would interfere with their importations of American fruit. They did not, I think, read the Act very thoroughly, or they would not have raised any very serious objections to it, because it does not interfere seriously with the importation of American fruit. In the first place, it only refers to baskets, and most of the American fruit is brought in in boxes. Then in regard to the strawberries, the American strawberry boxes are mostly larger than ours. In New York State and Massachusetts they adopted a legal standard, and their legal basket is not quite an Imperial quart, though very close to it, so that the Act would not interfere with anyone wishing to import American strawberries. When their boxes are larger than ours, it does not interfere; we don't care how many boxes are imported that are larger than ours; but we do not want them sold any smaller. I pointed out in the House of Commons that it would not interfere with any Manitoba merchant, and we never had a single objection in Ontario, and the Bill was passed in the form that it is here, that I have described. This year was a very bad fruit year in some part of the Niagara District. In the eastern part of the district, where peaches are grown very largely, the crop was very light, and there are some complaints from growers that they would like to see this Act staved off for another year—it is to go into effect

from the 1st of January—as they have a large number of baskets on hand. Under the Act any sized basket is legal, but if the basket is not of the sizes mentioned, then the one who uses it must mark on the side of the basket what it contains, so there is no hardship to anyone who has a few baskets, or even a thousand or two; he has only to get a stencil and mark on the side of the basket what it contains. It must be marked in full quarts and below what it contains; for instance, if it is 10½ quarts, it must be marked 10 quarts. If there is any strong feeling among the growers in any part of the country to carry it off for another year, I do not see that there should be any serious objection to it. Of course the eleven-quart basket is larger by nearly a quart than the basket that is being used largely in that district.

Mr. Boulter: Will that hold seventeen pounds of peaches?

Mr. Smith : I should think so, but I could not say positively, as I never measured them.

Mr. Boulter: What is the size of the baskets we are using to-day?

Mr. Smith: The sizes we are using to-day are so various that you can hardly say that. The basket I am speaking of is used largely around St. Catharines and the Niagara District, that they call the eleven-quart basket, and it holds only a little over ten, and that is the basket that will come in competition with this basket if the Act is not put in force at once.

Mr. Caston: I have measured a great many of what are called ten-quart baskets, and they hold ten Imperial quarts.

Mr. Smith: That would be an eleven-quart basket, although they call them 12 quarts.

Mr. Boulter : Why didn't you adopt a basket that would hold a quart, or why did you not consult some men who were buying by the quart? We have the Imperial quart in Canada, and in the United States the wine measure quart. The baskets we have will hold about a wine measure quart. The canners must buy in some specific way; we cannot contract at so many thousand quarts per acre. We want to know what that quart means. We make a standard that a quart of berries shall weigh a pound and a quarter, and the ordinary basket filled up, as it should be, from the corners first, and not in the centre and tapering down in the corners, will hold a pound and a quarter. Now, why did you not consult some of the parties who were interested in buying berries? We would have been only too anxious to have a quart of berries in a basket. We don't want four-fifths of a quart.

Mr. Smith : You are not getting a quart now. This basket is exactly the size of the basket you are using now.

Mr. Boulter : When I am contracting with farmers, how am I to contract, by quarts or by pounds?

Mr. Smith : By boxes. The farmer cannot use any smaller box, unless he marks it on the box.

Mr. Boulter : I guess we will have to take the old principle of buying by the pound. I am sorry you have adopted a box representing a quart, that does not hold a quart.

Mr. Smith : Get five of those, and you will get four quarts.

Mr. Boulter : We don't want any friction. We have enough of that now with you fellows when we buy peaches. (Laughter.) This is a very serious question, this fruit packing, and I am glad we have our inspectors here to look after it. There is one way in which a strawberry box acts differently from anything else. You fill a strawberry box with gravel, and the bix stones will work to the bottom, and the little ones to the top, but with strawberries the box works the other way. (Laughter.) How are we going to contract for strawberries?

A Delegate : By the box.

Mr. Boulter : That is uncertain. If a packer fills the box up in the centre, and allows the corners to run down, you have not a half or three-quarters, let alone a box.

Mr. Caston : See that they fill them well.

Mr. Boulter: I think it is a mistake not to have a strawberry box a full Imperial quart.

Mr. Smith: Theoretically I agree with you. I would like to have seen it a quart, but on consultation it was found practically impossible to suggest a package that was very much larger than the one already in use. They very naturally said: "If you make those boxes to hold an Imperial quart, whereas the ones we are using now only hold four-fifths, we will get only the same price for them."

Mr. Caston: That is right; you would not get one cent more for them.

Mr. Smith: So you have to adopt something that may not be thoretically correct, but is practically so.

The President: The Act has been passed, but it is not in force till the 1st of January; that is the position. I may say that some of us used this basket this summer, consequently we sent out some thousands of quarts more than the others who did not. This is a great injustice. If the Act is not in force, will the basket manufacturers go on manufacturing the old baskets?

Mr. Smith: Some of them certainly will.

The President: I would certainly say, let it be enforced. It would be fair for the grower and fair for the consumer.

Mr. Smith: It will be enforced unless there is a petition asking that it stand over for another year, which there very likely will be. I should like to have the sense of the meeting so as to know what stand to take when the question comes up in the House to stave it off for another year.

The Secretary: I move that this Association approves of the work of this committee on fruit packages.

The resolution was seconded by A. M. Smith, and carried.

THE APPLE BARREL.

Mr. Caston: I would like to ask Mr. E. D. Smith about the barrel. Is there not an Act of Parliament altering the size of the standard apple barrel of this country to that of the American barrel, just a few inches shorter and holding a few quarts less?

Mr. E. D. Smith: There is an Act that makes the Nova Scotia barrel the legal barrel, but it is optional; you may use the old Canadian barrel if you like.

Mr. Caston: Do you think we should recommend that it should become universal?

Mr. Smith: I don't know; that is a debatable point.

Mr. Caston: I think we should hear from the apple packers present. Our meetings have frequently expressed the opinion that Nova Scotia, the United States and Canada should have one size of apple barrel.

Mr. Smith: The American barrel holds six quarts less than ours.

Mr. Boulter: I don't know that our people get any more for packing their apples in these larger barrels than the Americans do for their smaller ones.

Col. Rogers: I think the barrels should agree in size with those of Nova Scotia. The Old Country market is guided greatly by the Nova Scotia product. That was an important shipping centre long before we attained anything like the proportions we have now. I speak as an apple-grower and shipper; we are at a great disadvantage in shipping a very large barrel when we actually ship in competition with Nova Scotian apples; therefore, I think we would be wise in adopting their barrel as a standard.

Mr. Smith: I may point out that most of our stave mills make staves to supply apple men in the United States, so that they have a stock of staves of the right size for us almost always on hand. The Act now provides that the Nova Scotia apple barrel is the legal barrel, but it does not make it compulsory; you can use the old Canadian barrel, that holds six quarts more. That is, you cannot use any smaller barrel than the Nova Scotia barrel, but you can use one as much larger as you like.

THE METHOD OF GRAFTING.

Mr. Morris (Fonthill) : All fruit growers do a large amount of grafting, and I have done a large amount, and do every year. The old system is to put the scions in one at each side. One of them has to be cut off, and it leaves a short edge there that would be a source of throwing suckers for years. Now, the plan that I adopted as an experiment last spring was to cut the limb off on a bevel, and then cut a little square off on the sharp corner and put one graft in there. Every good grafter ought to make nineteen out of every twenty scions grow. This method saves time. When that graft commences to grow the cut will commence to heal over, and it will not send out suckers as on the old plan. In this plan you should choose somewhat smaller limbs. You can notice in this sample how it has begun to callous over already, and in two years you will scarcely notice that it has been grafted at all. (Applause.)

Mr. Huggard (Whitby) : If you will call at my place you will find some trees that were done that way in 1896, and those trees have healed over in such a form that you can scarcely tell where the graft was inserted, the cut being made on the bevel instead of the square, and one of the trees this year produced over three barrels of apples.

Mr. Morris : I may say I never saw it done, and it was an idea of my own.

Col. Rogers : Do you advise paring the bark back when you finish a graft, or do you leave the limb as the saw leaves it?

Mr. Morris : I would advise smoothing it over a little with a knife.

Col. Rogers : I find some people who round it off nicely, which I think would hinder the healing process just that much. I like to use a fine saw and leave it as the saw leaves it.

BEES AND FRUIT.

By Wm. Saunders, LL.D., Director of Experimental Farm, Ottawa.

I want to show you, first of all, some samples of apples that were sent me yesterday by Mr. Hamilton, who has had charge of the fruit exhibit at Glasgow during the past year. These are apples that were grown in 1900, and kept in cold storage and shown during the whole period of the Glasgow Exhibition, and have endured the journey across the Atlantic without very much bruising, and are still in very fair shape, He says the two varieties were the Lawyer and the La Salle, but I think he has made a mistake in putting them up. I have the La Salle; it is a Quebec apple, which kept very well during the Exhibition at Paris last year; it was among one of the best up to a late period. It is not often we can see an apple so old as that and still in good condition.

Another subject is the result of some experiments we have been making at the Central Experimental Farm during the past year in reference to the question whether bees can puncture fruits or not. It is a question that has agitated the public mind for a very long period. More than a thousand years ago it was under discussion, and Aristotle, in one of his volumes, writes in defence of the bees, and says that the bee cannot puncture fruits to suck their juice, but that wasps and other insects can. Quite recently there have been some law suits over this quesiton, and while it seems as if it were not one of those things that admitted of very much that could be said against the bees, still the enemies of the bees have done their best under such circumstances. These lawsuits, have, I believe, all been decided in favor of the bee-keepers. From the structure of the parts of the bees' mouths it is very evident that there is no possibility of their biting a tough substance, or a moderately tough substance, such as the skin of a grape would be. The parts of the mouth which correspond to those used in wasps for biting, and which in the case of wasps are larger and saw-like, and capable of seizing anything and tearing it, in the case of the bee are like two small spoons, and they only admit of a side motion, and when brought together they look in the microscope like two small spoons passing across each other, and they are used by the bee to manipulate the wax to build the cell and are not capable of being

used in any way to seize anything with a view of tearing it. In 1884 or 1885, when Prof. Riley was living, and had charge of the Entomological branch, the Agricultural Department of the United States undertook some experiments in Illinois, and they were carried out in this way: Fruit was exposed in a sound condition to the action of the bees, where they could get at it quite freely. Another lot of fruit was dipped in honey or a honey solution and also put in an open place, and another lot was subject to punctures at different points by a needle or a knife, and also put where the bees could get at them. These experiments were continued for some weeks, and in every instance the result was the same—the sound fruit remained sound to the end of the time ; the fruit which had been coated with sweets had every trade of sweet sucked off or scraped off the outside, so that there was no taste of sweetness left on the outside of the fruit, and those which had been punctured were more or less sucked dry by the bees, which had inserted their soft brush-like tongues into the interior and taken out the juice and appropriated it. These experiments, however, were tried by the Department of Agriculture in Washington in a closed room, which was covered with wire netting, so that the bees were confined to that room, and were not able to get out and in as they pleased. This last year at Ottawa Dr. Fletcher planned some experiments which were carried out by Mr. John Fixter, who has charge of the apiary at the Experimental Farm, and who is a very careful and painstaking experimenter, but in this instance the bees were allowed their freedom to go where they pleased, and go in and out of the hive as they chose. The time selected was the early part of September, when there was a great scarcity of honey, and none of the hives were making wax, and four colonies of the black or German bees were chosen, and the colonies were about equal as to strength. In two of these colonies all the honey was removed, and the frames put back as far as the honey was concerned, but three of the frames were fastened together with a strip of wood, so as to form a little chamber, and in this chamber were hung samples of grapes and other fruits, so that the bees would have them always before them during the time of the experiment as long as they remained in the hive. This fruit was in its natural condition, but it was carefully examined to see that there were no unsound tissues, and it was mostly grapes, and each of these two hives and this chamber filled in that way with fruit. In the other two hives there were five of the frames left with the fruit in them, and more or less honey, so that the bees had something which they could feed on for a short time. In connection with the second two hives, the small amount of honey was in the hive in connection with the fruit, but in those hives also there were frames tacked together and forming a little chamber in each to hang these little bunches of fruit. Then a super was put on each of the hives to form another chamber for fruit, and in one of these partitions were laid grapes and other fruit which had been dipped in honey, which had been warmed to make it thin and then the fruit drained. On the other side of the super the chamber was filled with fruit that had been punctured here and there with the point of a penknife. As soon as the arrangements were completed, and the bees had access to the hive, they at once settled upon this punctured fruit, and began to drink or imbibe the juices out of the grapes and pears and peaches and plums, all of which were represented in this experiment. They also clustered very thickly on the fruit which had been covered with the sweet solution, and rapidly consumed that Indeed, by the next morning there was practically nothing left of of the sweets that had been put on the outside of the fruit. They clustered also on the sound fruit and travelled over it and over it and over it again, but did not injure or break through the skin in any one instance. The bees were altogether kept in this way for a week, and at the end of the week the whole of the fruit was examined and found just as I have described. The fruit that was put in sound in every case remained sound, and the specimens that had been punctured had their juice more or less extracted, and the bees had been feeding on them in lack of other food, because honey at that time was scarce. Besides the grapes within the hives and in the super there was another lot of honey on a small Norway spruce tree, which was growing in the apiary yard, so that one-half of the tree was pretty well covered with fruit from top to bottom, where the bees had access

all the time. Another lot was put on shelves in a workshop that was close by, the windows being left open so that the bees could fly in and out as they pleased. They did not visit this fruit in the workshop so fully as they did that on the tree. They clustered around anything and everything that could be got to eat there, but the long and the short of the matter is this : That at the end of the week the fruit was all in the condition that I have explained to you. It was then thought best to continue the experiments for another week, and the punctured fruit and the dipped fruit was renewed, but the sound fruit was just as good as it was when it was hung out over a week before, and so it was left for a second week. There was a repetition of some of the movements of the bees clustering very heavily on the fruit that had been dipped in sweets and working their way into the fruit that had been punctured, but the sound fruit remained untouched, and this notwithstanding the bees were hungry, for towards the end of the second, and more particularly towards the end of the third week, a good many dead bees were found all around the entrances that had evidently died from starvation, and all this time there was plenty of food within reach if they could only have managed to get through the skin of the grapes. The third week the whole of the fruit was renewed, as some of the specimens were beginning to decay, and at the close of the third week it was thought not necessary to continue it any further, it being amply demonstrated that the results which had been obtained at former experiments where the bees had been confined were amply confirmed by these experiments where the bees were allowed to go and come as they pleased. I do not bring this before you as anything exactly new, but merely as confirming by more careful tests the conclusions which have been reached for many years past by thoughtful men, both pomologists and entomologists, who have studied the subject more thoroughly, and who have understood the structure of the organs of the insect ; and these new experiments amply confirm the conclusions which have been reached in the past, that the bees cannot, and hence do not, puncture sound fruit. They do, however, visit and injure considerable fruit that has been cracked, and in some seasons, especially in British Columbia, where they have a great deal of moisture, cherries have suffered very much from cracking, and then the visits of the bees in large numbers would injure the cracked fruit, but at the best the fruit was only injured fruit, and not of very much value. That is about all that can be said about the bees, other than this, that they have what is sometimes called a business end, which they use without hesitation on parties that disturb them, but that sting is designed for defence, and is mostly used for that purpose. You can very easily rouse some members of a crowd of bees to using their sting on you, if you only go amongst them and strike about here and there, as if you wanted to knock some of them down. Where they are in very great numbers, and where they swarm in an orchard there may be some trouble ; but, on the other hand, they are exceedingly useful to the orchardist, and very often give him a good crop of fruit where otherwise without their help the crop would be considerably less. They are very wonderfully made for one purpose, namely, the distribution of pollen. We know that plants require cross-fertilizing by the pollen of other plants if the vigor of the race is to be sustained. Nature abhors in-and-in breeding in almost every instance, and the result, if carried on, is a weakening of the progeny, and sometimes the gradual extinction of the species, or variety results. The important purpose that the bees serve in carrying pollen from one flower to another, and their great activity, the amount of ground that they can cover in a short time, and fact that when the bee is working on one particular plant he prefers to work on that particular plant, or fruit, or tree. These facts are all very much in favor of the bees when looked upon from the standpoint of the benefits they confer on the pomologist. The bee not only unconsciously does this cross-fertilizing by carrying the pollen from one bloom to another, but it also collects large quantities of pollen which would otherwise be wasted,and makes use of it as food. In the lower part of each hind leg of the bee there is a little cavity, which is known as the pollen basket, and by a peculiar arrangement of hairs on the leg the bee is able first of all to gather up the pollen on those legs and then comb it from one to the other, and the basket becomes full, and it carries it in that way home to the hive. Now, when a bee is working in an apple

orchard it gets plenty of nectar there and plenty of pollen, and it goes from blossom to blossom working away and knocking about the blossoms and covering the pistils with the pollen from other blossoms and other varieties of apples, and in this way works so busily all the time that a hive or so of bees in an apple orchard will probably accomplish more in the way of cross-fertilization than almost all other insects that would available at that time, on account of their great activity and the amount of ground they cover, and their usefulness is increased by the fact that they generally stick to one line of work when they undertake it, and when they work among apples the pollen is more easily distributed, and it is more effective in its result. As you know, I am not a special bee man, but I feel an interest in this bee experiment, and I always like to see justice done to every class in the community wherever they belong, and give them credit for the work they do. I think pomologists everywhere should rather encourage than discourage bee culture, looked at even from a purely selfish standpoint.

The Secretary: The bee has been accused of another evil, namely, carrying the blight from blossom to blossom when trees were affected with blight and allowed to stand in the spring and produce bloom. It has been stated by some American authorities that the bees visit the blossoms of the affected trees and carry the blight to those that are not affected. I would like to ask the doctor what he thinks of that.

Dr. Saunders: I think no doubt they could. So could other insects, and there are other insects visiting trees besides the bees and abolishing the bees would not abolish the blight, because other insects would carry on the work. If a pomologist allows blight to remain on his trees he must expect that a disease source of that kind will not remain long without spreading, and immediate action should be taken when blight is observed affecting the young tissues of trees to cut it off and burn it, because we know that it results from the small organization called a micrococcus—a very minute body which insects gather unconsciously in the nectar, and carry it to other blossoms, and in that way distribute it. But if you exterminate the bees it would be distributed by other insects. I have been very much interested in watching a flower for ten or fifteen or twenty minutes to find how many different insects will visit it in that time. If any of you have any doubts about the effectiveness of insects in assisting the horticulturists in cross-fertilizing you would be surprised at the number of insects, especially on a warm day, about ten or eleven in the morning, when the pollen is bursting most freely in the little capsules on the stamens of the flower, and you will find at that time the insects are busiest about the blossoms.

Mr. Morris: I have always been under the impression that the "Yellows" was carried from tree to tree and from orchard to orchard by the bees and other insects. I have seen a single peach on a tree affected with Yellows, and the rest of the fruit sound, as well as the tree itself, apparently, and sometimes I have noticed a few peaches on one limb affected, and I became convinced that it was the result of bees' work.

Dr. Saunders: With that I have had no experience. I live in a part of the country where, unfortunately, it is impossible to grow peaches, and we cannot even grow the trees, so we have no "Yellows.".

Cross-Fertilizing of Apples.

There was another topic on which I was going to speak, and that was on the results of the work that has been done in cross-fertilizing wild Siberian Crabs at Ottawa, with a view of producing apples which would be hardy enough to stand the climate of all the settled parts of the North-West country. This, as you can very easily understand, is a very worthy undertaking. Those of you who live in districts where fruit is abundant can hardly understand the condition of people who live far, far away from any such districts, who very seldom see or taste fruit unless they can afford to pay from $5 to $7 a barrel for apples, which most of them cannot do. Then many varieties in any case would not keep so as to bring them to the more remote districts of the North-West without spoiling. Almost every individual living, I think, appreciates fruit; there are very few indeed but who are very fond of it, and

desire a good quantity of it from time to time to keep their animal economy in a good state of health. Fruit is a very healthful article of diet, and there is no fruit quite so important as the apple ; hence the early settlers of the North-West country, when they moved there and found good land, and what they thought was a very fair climate, sent to Ontario and the east for apple trees to plant out, thinking they could grow these fruits there by giving them a little more care and shelter than they would require in the east. But in almost every instance dead failure was the result of all these efforts. As a rule no variety of eastern apple will grow and mature its fruit in any part of Manitoba or the Territories, except in a very occasional instance, where the conditions of shelter are unusually good, or where the altitude of the place is low, that is, where it is not very much above the sea level. In the neighborhood of Winnipeg the altitude runs in the neighborhood of 700 feet above sea level, and in the district down about Morris, about 60 miles south of Winnipeg, and down at Nelson, we have experimenters at work who have succeeded in growing the Transcendent Crab. Sometimes they will have a fair crop on some trees, and they will grow the Russian apples, but these cases are exceptional, and when you come to Brandon, 140 miles, you are 1,200 feet above sea level; at Indian Head you are 2,000 feet above; and at Calgary you are 3,100 feet above the sea level, and it is practically impossible to grow any varieties of apple which we grow in the east over any of that district. When the experimental farms were established, one was established at Brandon, and another at Indian Head, by the Dominion Government, and we began a series of thorough experiments, testing every variety which promised to be hardy, and a good many others, indeed, which did not promise to be hardy, because we wanted to gather all classes of apples so that we might be able to say to settlers hereafter, if the experiments were well advanced, that it was useless to plant any of those varieties because we had tested them all. We tested during five or six years about two hundred varieties of apples, a large proportion of which were brought from Siberia and other northern parts of Russia and Northern Europe. We also tested all the varieties that had been tested in the Western States, so that the tests might be very thorough; and while we have tested thousands of trees at Brandon and Indian Head, of those 200 varieties of apples, beyond two or three little clusters of the Transcendent Crab, which we had at Brandon, we have never grown an apple from any of those trees. In 1896 some seeds of different sorts of shrubs and trees were sent to me from St. Petersburg from Dr. Reswig, who is Director of the Botanic Garden of St. Petersburg, and among these were some seeds of Pyrus Bacata, known as the Burrit Crab of Russia, and these seeds were sown and came up, and in 1899 some young trees of this Pyrus were sent to Brandon and Indian Head to be tested there as to their hardiness. At that time I had no idea of their value, except that as an ornamental shrub it blossomed freely, and the fruit was bright-looking when on the trees, but we did not suppose the fruit had any value. These trees were found to be perfectly hardy, and in four or five years they began to fruit, so that about 1893 or '94, when the hardiness of this very small crab had been definitely ascertained, experiments were begun at Ottawa in the way of cross-fertilizing this by operating on the pistils in the blossoms with the pollen from larger varieties of apples, using the Tetovsky, Wealthy, and Duchess mainly for this work, because these three varieties were very hardy themselves, and also using the pollen of the Transcendent, the Hyslop, and Orange Crabs. so that we might have a strain of fruit in that direction. Four years from the date putting out the yearling seedlings, 36 of those trees fruited, and when these fruits ripened we found that they were a great advancement on the original crab. One or two of them were just about the size of the Transcendent Crab, and in quality are better than that. These particular ones have been tested at both localities I have mentioned for two or three years, and have given no sign whatever of injury during the winter. The process of crossing was carried on until now we have crosses of from twenty to twenty-five different varieties of apples, taking all the leading sorts in cutlivation, especially the hardier forms, and we have had altogether about sixty or seventy of those fruit every year; there are fresh trees fruiting, and out of those sixty or seventy we have some sixteen or seventeen that have been named, and nine of those include three or four of

those that are figured on the engraving I hold in my hand, and of the other newer fruiting trees nine of them were of that size and quality which would warrant us in distributing as fast as we can these young trees for testing in different parts of the North-West country. We have been trying to do that, but we have not been able, only having one small tree to cut scions from to make enough root grafts, yet to do more than place two or three trees here and there throughout the different part of Manitoba and the North-West Territories. But we have the trees established, and they are growing and doing well; and I have no doubt that within a few years we shall have, as a result of those experiments, useful sorts of apples, which, although small, will be very acceptable to those people who heretofore have had to send so far away for fruit, and will also help to remind them that there are such things as apples; and when they eat those which they grow at home it will only whet their appetite to buy more from Ontario of the better ones which they cannot grow at present, and give them a very useful and helpful addition to their diet, which is very much needed in that part of the country. In addition to this work of distributing the varieties which have proven themselves to be good by fruiting with us, we are also carrying on another line, that is, sowing the seeds of the best of the specimens of those fruits that we fruit, and distributing the seedlings in small quantities here and there over the country. We are establishing a very large orchard of them, one of two thousand trees, at each of the Western Experimental Farms. We have about 600 of them growing at Ottawa, and that is as much as we find room for, and now we are growing seedlings by the hundred, and we hope to grow them by the thousand and distribute little bunches of these to different people in different parts of the country, and when these fruit we shall have the advantage and benefit of many new varieties, which probably will be better than any we have sent out ourselves, for this reason; when you sow the seed of a cross-bred fruit, such as I have been describing some seedlings will sport back towards the female parent and some of them will sport towards the male. In all these cases we used the Siberian Crab as the mother, and have used pollen from the larger apples. Hence you see that any sporting in the direction of the sire will bring the larger fruit, perhaps a very much larger one, and a better fruit, and by multiplying the chances, by sending these young trees all over that part of the country, we shall within twenty years I hope see fine, useful varieties large enough to be of great value to the people, springing up here and there as a result of this work, all over the Dominion, until we shall have every part of the northern country provided with useful food of this sort. The larger crab shown on this engraving, which has been called the St. Charles, makes very good apple sauce. They all make exceedingly good jelly; even the smallest of them are perhaps better for jelly than the larger ones, because the pectin from which jelly comes is associated more particularly with the cores and skins of the fruit, and as these little apples are nearly all core and skin you can easily see that a pound of them will produce more jelly in proportion than a pound of apples containing a good deal more of the flesh. I have presented these two subjects because I wanted the Fruit Growers' Association to understand the important work that is going on in that direction, and I believe that it will be continued with the best results. The people all over the west are clamoring for these. They have been crying, "Send us some, no matter how small they are; let us have some of them," and letters such as these are coming from all parts of the country, so that we find it exceedingly difficult to meet a tithe of the demand, but we hope by adopting this process of disseminating seedlings as well as grafted specimens of those which we know to be of certain value, we shall be able to reach a large part of the community with these useful products. (Applause.)

W. A. Whitney: Dr. Saunders spoke of some of these seedlings sporting back to the male or female. He says if it is to the male they will be larger. Would the larger fruit partake of the weakness, say, of the Wealthy? Would it interfere with the hardiness of the fruit if it is larger?

Dr. Saunders: That of course cannot be answered very positively yet. My statement that these do sport back to the male very frequently is made on the strength

of some experiments we have been carrying on with some crosses in barberries, and also on the general experience of botanists. We take the Barbaras Splendia, which is a Japanese species, and cross it with the European barberry (Barbaras Vulgaris) with purple leaves that bears its blossoms and fruit on long clusters. When these two species were crossed we got four seedlings which were just intermediate between the two. There were not any of them purple, they were all green, they took after the female in that respect, but in the blossoms there were none of them single like the female, and none of them long like the ordinary purple, but they were a little less than half of the purple, and they were not like it in foliage and other characteristics. We have sown the seed of those. We used about 600 of those seedlings and about 25 per cent. of them have come purple, some of them a deeper purple than the original male. They have not blossomed yet, but from their growth and appearance it is quite evident that this proportion have taken the characteristics of the male in color, foliage and growth of plant, and no doubt when we come to fruit them them they will have those peculiarities also from the male, of similarities of fruit. As to whether these will be hardier or not if they partake more of the male characteristics we cannot say, but if half and half, if I may be allowed to use the expression, in the first cross they have shown themselves to be perfectly hardy, quite as hardy as the female, we have good hopes that if they sport a little more towards the male they will retain their hardiness, because we know that it would not require a great deal to add to the hardiness of such apples as the Wealthy and the Duchess and the Tetofsky to permit of their fruiting in Manitoba, because they occasionally fruit in the neighborhood of Winnipeg at these lower altitudes I have spoken of.

A Delegate : What seedlings do you use to make these grafts ?

Dr. Saunders : The seedlings of the small Pyrus baccata, so that the root is the root of the female in each case. We have, however, tried a few of the Martha Crab root, and while we have not tested those sufficiently to speak very clearly on the point, yet we expect they will be just about as hardy, because the roots of the Martha Crab have survived at Brandon and also at Indian Head for a number of years, although the tree is killed back there more or less, killed back enough to prevent its fruiting, but the fruits are there.

FRUIT IN SIMCOE COUNTY.

By G. C. Caston, Craighurst.

I want to draw your attention for a few minutes to a section of the country that has not been noticed heretofore very much as a fruit growing country—that is the Georgian Bay District. I notice several gentlemen here that have come all the way from that District to attend this meeting—one from the County of Bruce and several from the County of Simcoe, where I live, and some of the most successful fruit growers of that locality. It is not a long time ago since it was thought that fruit growing could not be carried on very successfully very far outside of the Niagara Peninsula, but every year seems to demonstrate the fact that successful fruit growing is moving farther northward gradually, and it is moving farther north than any of the people had reason to suspect some years ago. Some people will be surprised when I tell them that on the shores of the Georgian Bay are produced some of the finest peaches that are grown in Canada. If you will visit the Collingwood show in the fall of the year you will find a dozen plates of fruit that, so far as size and appearance and everything are concerned, are as fine as anything you can find in Canada. That is pretty far north, but there are climatic influences that affect that part of the country. There is a strip, not as large as the Niagara Peninsula, not as large as the famous Bay of Quinte district, but still capable of producing fruits of the very finest quality. There is no section of North American were the climatic conditions vary so

much, especially as regards fruit growing as this Province of Ontario. That is on account of its geographical situation, being surrounded by its great likes and being like a wedge forced down between those lakes.

People will hardly credit the effects as to the variety of the climate for fruit growing. While on the Georgian Bay you can grow peaches, yet twenty miles back you would not be able to produce peaches at all; you would not probably get the wood of the trees to live over the winter. You certainly would not get the fruit buds to live over the winter. With regard to the capability of this Georgian Bay fruit strip for producing fruit, I want to give you some figures as to the size of the fruit industry, which is a comparatively new one there. The area with which I am dealing now is on the shores of the Nottawasaga Bay, which is a part of the Georgian Bay. Take, for instance, the Town of Collingwood, that has been famous for some time for the production of plums. Almost any variety of plums can be grown there to the greatest perfection and in almost any quantities. During the past year there were 80,000 baskets of plums shipped from the Town of Collingwood alone. In the neighborhood of Collingwood there are more than 25,000 barrels of apples yearly; this year there were 10,000 barrels shipped from that port, and this is an off year. In the vicinity of Creemore, take the section embracing part of the Township of Nottawasaga, part of the Township of Mulmer, and part of the Township of Sunnidale, there are produced in an average year from 35,000 to 40,000 barrels of apples and in the neighborhood of 130,000 baskets of plums. Farther north than that again we have Meaford, Thornbury and Clarksburg districts; in one year alone there were shipped about $80,000 worth of apples. Those of you who get account sales from Liverpool, London and Glasgow will find for years back quoted "Finest Georgian Bay product." which is a high compliment to that country as a fruit-producing country, because there are a great many barrels in Liverpool, London and Glasgow that are marked "Finest Georgian Bay product," that never felt the cooling breezes of the Georgian Bay. The soil in that locality is particularly well adapted to the production of the finest apples. The underlying strata is limestone. The soil in most cases varies from a nice rich loam to a rich clay loam somewhat rolling. Looking across the Nottawasaga Valley from where I live, what we call the Blue Mountain appears, to all intents and purposes to be a mountain grade. All up the sides of that mountain is the very best of fruit land, producing apples of the very finest quality. We have another advantage; in the spring of the year the prevailing wind is from the northwest. and the floating ice of the Georgian Bay is kept floating around there till late in the year, so that the trees are practically in cold storage, and the blossoming is kept back a good deal longer than it is in other parts of the country, so that they scarcely suffer any damage in the blossoms. Then across from Collingwood, and what we call the Cape, and across Georgian Bay and Lake Huron there are possibly 150 miles of open water, and during the winter the cold waves invariably come from the northwest, and in passing over that stretch of water the air for a few miles around the shore is tempered. When the air passes inland again it becomes much colder when it loses the influence of the water. but around the Georgian Bay we have not the same records of low temperature that we have a little bit inland. I notice the Mayor of Stayner here. He lives in the centre of one of the fruit districts. We have Mr. Cox, one of the most successful fruit growers in that district, and I would like to leave the discussion of this subject to them. During the last year they have succeeded in forming a local association in the Georgian Bay District. I think that is a grand idea. Fruit growing is going to be one of the greatest industries in the near future in Ontario, if it is not so already, because it has been truly and aptly stated that Ontario is destined yet to be the apple orchard of the world, and wherever the fruit districts are there ought to be an association in affiliation with this Provincial Association. I think with this local association we will be able to do a great deal more good than we can now. One grand idea in organizing the Georgian Bay Association was to co-operate in marketing and shipping fruit. There are hundreds of acres of that fruit land ready for the planter. and I do not think any man could make any better investment anywhere in

the line in agriculture than in some of that apple land, planting it out in some of the best varieties, and I think he would have a very sure thing for the future. I want to call attention to some apples that have been grown, some of them new varieties, in an experimental way. We hear a great deal about the Ben Davis Apple, and if you canvass the fruit growers of this country the invariable answer would be that they made more money out of the Ben Davis than any other they grow, because it bears so early, so abundantly, stands shipping so well, and brings such prices at the other end of the journey. But here is an apple that I think is going to surpass the Ben Davis. It is a better apple, and I think handsomer, the tree will bear just as early and abundantly—that is the Gano. That is one of the coming apples of Canada. I believe it will take the old country market possibly better than any other apple that has been introduced there for a long time. It is a better keeper, as it will keep until May or June in good condition, and the tree can be hardly distinguished from the Ben Davis, having the same habits and growth.

A Delegate: Is not the Gano generally said to be a seedling of the Ben Davis ?

Mr. Caston: Yes, I think it is of that origin. The two trees planted in 1895 produced half a barrel apiece; this year the two produced a barrel of marketable apples.

Col. Rogers: At what age were they planted ?

Mr. Caston: Either two or three years. Here is another apple sent out in 1995, a very handsome apple, the Boiken. I think this is going to be a very nice apple. It begins to bear as soon as you plant it out. You plant it next spring and it will begin to bear the next year, and it will keep at it right alone. The appearance of the tree is very much like the Golden Russet, and the bark and the habit of growth in the top very much resembles the Russet—you would think it was going to be a Golden Russet. That apple looks very handsome in a barrel. It is not affected by scab, and you can see by the state it is now in that it must be a good keeper. I think nearly every specimen on the tree was as highly colored as this one.

Mr. Bunting: The New York people had that apple in good condition in the month of July.

A Delegate: Is the Gano a good keeper ?

Mr. Caston: Yes, just as good as the Ben Davis. I think it will be a compromise between the Ben Davis and the Baldwin.

Mr. NcNeill: I had a Ben Davis three months ago of 1900 growth without cold storage, grown in Collingwood.

Mr. Caston: Here is another apple called Downing's Winter Maiden's Blush: It grows a little larger than the ordinary Maiden's Blush. Here is another of the new varieties that I think is going to be a very good one. I think we should be very careful about recommending new varieties until we are sure that they are worthy of being cultivated. This apple is so new to me that I am not going to recommend it as yet, but I think a great deal of it and I think I will be able to recommend it. Here is an apple that most of you looking at it offhand might call the Northern Spy; it is about the same color and the same conical shape, it is the Salome; it is a good quality and a good bearer. These apples I have here have no scab on. If we can get an apple that is a good commercial variety that will sell well, bear well, that begins to bear young and is free from scab, those are great points in favor of them.

Mr. Boulter: Have those trees been sprayed this year ?

Mr. Caston: Yes, of course, I always spray.

The President: Were there any other varieties scabbed ?

Mr. Caston: Yes, some that were sprayed. I cannot keep the scab entirely off the Fameuse and the Flemish Beauty Pear if I keep a barrel under the tree and sprayed them every day. Here is an apple that succeeds very well in Simcoe, and I think all over Ontario. In the market I am catering to—Nipissing and along the C.P.R. and the Northwest—it is a very good article, the Fallawater; it is a cooker. I want to call attention to another thing. I have been preaching the top-grafting of

apples for a good many years, and I believed I was right, and I believe so yet, and the more experience I have had the more I am confirmed in my belief that we will succeed best in producing our best winter apples with regard to profit and high quality by top-grafting a great number of the best varieties on good hardy stock. Compare this Ontario apple grown on its own stock as it comes from the nursery with this one top-grafted on a nice healthy Spy seedling. Now you know the Ontario is a cross between the Northern Spy and the Wagener. Where it is top-grafted on a seedling it comes nearer the Northern Spy, whereas grown on its own stock it does not look so much like it. There has been a great deal of controversy on the subject as to how much the stock influences the fruit. We have been testing a good many Russians which Dr. Saunders kindly sent me some years ago. I found them almost invariably hardy, heavy trees with dark green rich foliage, free healthy growers; our great trouble is we have not been able to find a keeper. Some very nice looking apples, coarse in texture, too, of good cooking quality, but we could not get a keeper. This year I have fruited one that comes nearest to being a good type of apple. It is one that Dr. Saunders sent me about 1890 called the Bode. It is a summer apple. Among the Russians, here is the nearest approach to a winter apple, it is the Bogdenoff. It is an upright grower, thrifty, hardy tree, and it is the only one that makes any pretence at being a keeper that I have tried yet. It has nothing very much in the way of quality to recommend it. We have had great success with Russian cherries, which I believe to be one of the greatest acquisitions along the experimental line. They are succeeding admirably well. Prof. Macoun tells me that two-thirds of the fruit buds were destroyed at Ottawa in a temperature of some 20 degrees below zero last year. Not that he believes the 28 below zero destroys them, but the continued cold at that time. However, the lowest we had last winter was 20 below zero, and the fruit buds came out all right and produced an excellent crop of fruit, samples of which are upstairs.

A Delegate : What are the best varieties of those cherries ?

Mr. Caston : There are a lot of good ones ; it would be pretty hard to distinguish. The Ostheim is a capital cherry, almost black in color and one of very great excellence as a canning cherry. It is perfectly hardy with me, and is a fairly thrifty grower. We have two or three Russians under the name of Orel. We have the Brusseler, Braun and the Amarelle. In point of early bearing and productiveness I don't know that there is anything among them that will beat the English Morello, but there are a great many fine Russians. I could give anyone a list of four or five that would be suitable to plant in any section of Canada.

Mr. Smith : Are Richmond Ridge and Mortmorency not suitable ?

Mr. Caston : Yes, but we have two or three others that are better for culinary purposes. I want to say a word or two about an old familiar apple that I call the first commercial apple in Canada to-day, that is the Northern Spy. (Hear, hear.) We cannot produce too many of them in this Province of Ontario. We do not get enough of them. Some people say it has a tender skin, that it does not stand the package barrel very well, but we have not half enough in this Province to-day. One of the first things that will be said about that is that it will take too long, from thirteen to seventeen years, to come into bearing, which is true, but I have seen them heavily loaded in five years from the grafts. The way to grow that apple is by top-grafting it on some hardy seedling. I have been top-grafting for twenty years, and I would say top-graft the Spy on something hardy and do not be afraid of getting too many Spys—you cannot have too many. These Spys will sell like hot cakes in New York and Chicago and all those large cities, because we grow a better Spy in Canada than they do in the United States.

Mr. Jones : How long have you had those Northern Spy top-grafted trees bearing ?

Mr. Caston : For several years.

Mr. Jones : Can you give us an estimate of what a full-sized tree of twelve or fifteen years from the graft would yield ?

Mr. Caston: You would get a very large crop, probably four or five barrels from the tree. You know when the Spy does bear it bears a very large crop.

A Delegate: Do you find the Spy an annual bearer ?

Mr. Caston: It has not been with me, but it is getting to be so.

A Delegate: Is there anything in the idea of taking scions from individual trees ?

Mr. Caston: I believe that it is a fact that there is individuality in trees as well as in animals and men ; and you can perpetuate that individuality. For instance, you have noticed a row of Spys or some other variety with the trees as near alike as possible, from the same nursery and planted and grown under the same conditions, and yet you will find some individual trees, and you can perpetuate that individuality by taking scions from that tree and using them for top-grafting.

Mr. Boulter: Is the Ben Davis a hardy tree ?

Mr. Caston: No, it is only about half hardy with us.

Mr. Wm. Rickard (Warden of Northumberland and Durham Counties): The matter that has been brought out last is very important, and if I had been better advised along the lines that have been discussed to-day I would have been better off. What has been said about the Spys is all very good. I would like to know what Mr. Caston considers the best kind of stock to top-graft on.

Mr. Caston: Almost all those Russians are good stock. I have found that the Spy did remarkably well on Yellow Transparent, yet I think for all purposes, if I were selecting any particular one I would take the Talman Sweet. (Hear, hear.) I will tell you the reason. You have there a thrifty tree. You won't have any unsightly bunches; the union will be more perfect than with any other variety I know of; I could show you in my orchard places where you could hardly tell where the graft was put on. It seems to make an almost perfect union with almost any variety. It has a hardy trunk and a hardy root; it has a spreading habit of growth, and another important thing is that the limbs are well kuit into the trunk ,and they will bend to the ground before they will split, which is one of the greatest faults of the Spy which I notice in the Bay of Quinte district—the decay seems to get into the crotch, and you will find a great big branch fall off, and in another year or two another branch will fall off.

Mr. Sherrington: At what age or size would you have this stock for top-grafting ?

Mr. Caston: As soon as the tree is old enough to hold the graft ; that is if you are cleft grafting. Never cut the whole of the top off the graft in the limb; take only about a third of it off at a time and then you do not disturb the growth of the tree.

Mr. Shepherd (Montreal): I should like to give you my experience with the Spy in the Province of Quebec. My orchard is situated in the county of Vaudreuil. I planted one Spy tree for experimental purposes twenty-six years ago, and it only bore for the first time three years ago. Our climate is very much more severe than yours. That tree was killed down to the snow level three or four times, and the following spring it shot out above the graft, but the fourth time I was particular in training it and heading it in. It was not until the fourth time it began to shoot out from the graft that the tree began to get acclimatized, and now the tree is about the size of a Fameuse tree that has been planted for twelve or fifteen years, and last year I got off that a barrel of very fine Spys indeed. I merely tell you this to show you that we cannot grow Northern Spys in the Montreal district unless we top graft. I have not had much experience with Talman Sweet as a stock, but I have had experience with Switzer. McMahon is one of the most admirable stock we could have for top-grafting. We cannot grow the Northern Spy on its own root. We count the Northern Spy your best winter apple. In Montreal when people want a first-class winter apple they always ask for Northern Spy.

Prof. Waugh: I may say that the problem of hardy apples has not very strongly interested us in Vermont, because in our principal apple-growing regions we are growing all the common market varieties, and for the most part grow them on

their own stock. The Spy, which is grown there largely, is seldom top-grafted, but is grown on its own stock; that is, grafted or budded trees are put out and people wait until they come to bearing. About fifteen years is supposed to be the time for Spys to come into bearing, and fairly good crops are got after fifteen years. I think the experience we have had in top-grafting the Spys and other varieties of that sort has convinced growers that it is better to top-graft Spys and other varieties which make poor trees, such as the Spitzenberg, which is a very fine apple and sells possibly better than the Northern Spy. The Spitzenberg brings very high prices. They used to be grown quite extensively in our neighborhood, but the trees are poor, short lived, subject to apple canker, and they die out, so that they have been almost given up by the growers. A few growers, however, who have some faith in this matter of top-grafting and have seen the benefits from it from the experiments they have made, are now going ahead and putting out considerable orchards of trees for top-grafting and are grafting over considerable quantities of trees they already had. Sweet apples were grown to a considerable extent, for example, Talman and Pound Sweet. In recent years the apple maggot, or Colorado worm, has been very bad indeed, especially on those sweet apples and especially Talman Sweet, so that it is nearly put out of the market, and the easiest and the quickest thing to do is to top-graft those trees, and considerable experiments have been made on that account, and these have been put in largely to Spitzenbergs and Kings. The King makes a poor tree, but they can be made fairly productive, and good fruit can be grown by a suitable method of top-grafting, so that these tenderer and, in many cases, much better varieties are now very largely grown in that way. Dr. Hoskins, who is well known by reputation, did a great deal of experimental work in the matter of hardy apples. His experiments were very interesting when they were being carried on. I am sorry to say that they have been given up now. The varieties which he tested and recommended are almost lost sight of in the State, not because his experiments are discounted, but because the district which he represented has never taken up the business of apple growing seriously, and because in the real apple growing districts the plainer varieties may be grown with practical certainty. His experiments have merely had the effect of demonstrating that apple growing can be carried on anywhere in the State of Vermont if a man has brains and energy to put into it. He had one of the most exposed situations in the States, clear to the northern line, at an altitude of 1,200 to 1,400 feet, and yet he made an admirable model commercial apple orchard there. (Applause.)

Mr. Morris: I am a great believer in top-grafting trees, but I do not think that the Talman Sweet is the best tree for that purpose, and as for the Russians I would not use them at all, they are too liable to sucker from the root; even Tetofsky and Duchess of Oldenburg do that. There is something about the union of the root there that causes them to sucker. First of all I would take a fine grown tree and graft a coarse grown top on it, so that there would be more check to the flow of sap, which would throw the tree into fruitfulness.

Mr. Caston: You will not get a much closer grown tree than the Talman Sweet, a hard, close-grained wood.

Mr. Morris: But the Talman Sweet is not a fast growing tree. Take a tree like the Jacob Sweet, the Early Strawberry, McMahon White—the trees are all considered fast growers, heavy, close wood, and they all make far better trees than the Talman Sweet.

Mr. Morris: I have something to say about the individuality of trees. Did you ever examine the soil those trees were in? I think you will find some bone there, or some manure pile. If one tree is specially fruitful, perhaps you will find that it has been barked. We all know that ringing the bark of a tree will throw it into fruit perhaps two or three years earlier.

Mr. Boulter: There is no trouble to get that done. (Laughter.)

Mr. Morris: Anything that stops the flow of sap will throw that tree into fruitfulness. You may take your knife and cut the bark around the limb and check the flow of sap; and the fruit buds will form around that limb.

Mr. Rickard: If Mr. Boulter will come up to our place I will give him an object lesson on the individuality of trees. I have in my orchard some sixty or seventy Northern Spy trees that have been planted a little over twenty years. One portion was planted two years before the other and they grew a very excellent Spy. Out of the 1900 crop some went over to Buffalo last May. The others were planted two years afterwards. The nurseries from which the two sets of trees came were a mile or two apart. Now I have three rows of fifteen trees to the row, about forty-five trees, about thirty feet apart each way. I can assure you there are no bone piles nor ash beds, the soil is identically alike, but the apples are distinctly different. I can go through and point out one tree that will bear a great many more apples than a tree thirty feet from it; they will be as large, they will color better and they will keep a great deal better. You may talk about two different kinds of Spys if you like, but they are radically different in every way; the others grow large, but they will never color, some of them will turn white, some of them will color a little. In 1900 I shipped to Glasgow some of those large over-grown Spys that did not color, and they did fairly well, but now here is the point, as to the keeping; those Spys that I spoke of first grew on one tree that is a little further to the west, within thirty feet of the apples that do not color and that will not keep; and I put them into the cellar to keep, and some of those apples would not keep, they were so radically different from the others that grew within thirty feet and under the same conditions. In shipping these apples by some mistake two barrels were overlooked. I picked them over and there was only one barrel out of the two, that is, there was one half rotten. Now at the same time I had in my cellar some twenty barrels of the sound variety of Spys which I took up; and they did not average six rotten apples in the barrel. However you have a mind to put it, I have come to the conclusion I would not plant a Spy tree from the root if you gave it to me, because I do not know what it would do. I would immensely rather plant something that Mr. Morris or Mr. Caston has mentioned and know where I took my scions from, because if I were going to take my scions from my orchard do you think I would take my scions from this tree when the fruit might never color well? Here is a tree thirty feet from it that will always color and keep well. Where will I take my scions from? I am as fully convinced of the individuality of trees as I am of animals or men or women.

Mr. Smith: Do those Spys run alike all the same through the row coming from the one nursery?

Mr. Rickard: It so happens that in 1874 from a certain planting they are all good and they bear well, and then, next to that, more being planted in 1876, there is one tree in that second planting that stands 30 feet from the other trees that is of the same variety as those planted in 1874, and it stands there while the good Spy stands to the one side of that. This one tree is at the end of a row, and the row runs right through, but they are all of the same inferior apple, the kind that does not keep.

Mr. Smith: The whole row?

Mr. Rickard: The whole row except this one tree.

Mr. Sherrington: I wish to corroborate what what Mr. Rickard says to the individuality of trees. I have the same circumstances in my orchard as he mentions, as I can show you by my samples upstairs. I have half a dozen Spy trees under the same treatment, soil and everything, and the apples are entirely different. One variety grows very large and it does not color, and it does not keep; the others of medium size color well and will keep till late in the spring, of the best quality. I don't know how it occurred.

Mr. Saunders (Mayor of Stayner): The address of Mr. Caston provoked, I think, a most profitable discussion. We have all learned something from it, I am sure. As the President of the Georgian Bay organization I must make myself known to the parent body here. From conversations I have had since coming down east here I think it is gradually dawning on the eastern people that the Georgian

Bay district is really the Garden of Eden. (Laughter.) Simcoe County, of which Mr. Caston spoke, is only a portion of the Georgian Bay district. Put in a nutshell, the Georgian Bay district is composed of the counties of Grey and Bruce and Simcoe, and the further north you go the better apple-bearing section of country we have. We have been very backward there in taking united action regarding the handling of our fruit. I have lived in that district all my life and know something of the fruit growing of it, but, like the fruit grower of the Garden of Eden, we have been handicapped; the transportation charges have been so terrible that, like him, we never shipped any fruit. It has been customary every year for an apple buyer, a goodlooking fellow with a smile and a joke and a laugh, to drive up to the farmer's yard and say, "I will give you 50c a barrel for your fruit." Which of you farmers down here would sell your fruit for 50c a barrel? Now we have become awakened to the fact that some change must take place, and last April, after consultation with a number of fruit growers in the district, we formed an association, but little has been done since. The season has been against us for apples, and plums are the only things that we are prepared to sell, and those would hardly bring any price at all, but our purpose in being present to-day and in organizing is to be identified with the fruit growers all over the Province. (Hear, hear.) The Georgian Bay district is of very much more importance than I can portray to you, when I tell you that plenty of farmers up there sell their orchards off-hand at from $1,000 to $4,000. That would indicate a large fruit-growing section, wouldn't it?

Well, I have seen year after year, and especially the past season, orchards there with probably 500 or more barrels of excellent fruit lying upon the ground going to waste, and the pigs driven into it. Now, we want to remedy that state of affairs. I am glad to say that enough interest has been taken for four or five of us to come down here and hear what the parent body is going to do; and we give you early notice of the fact that I would like you to listen to the representative of this delegation and bring your body up to meet with us next year, come into the best fruit-growing district of the Province. (Applause.)

Mr. Cox (Collingwood): I have been in the fruit business all my life. Some years ago I went security for a man for $4,000, and I had it to pay, and it made me a poor man. Dr. Aylesworth asked me if I would put out an orchard for him, and I agreed to. I put it out in the Georgian Bay district. I stopped there ten years. I bought the place since. There were 36 acres. Before I went there I said I would not have the place if anybody gave it to me. When I came to put out the fruit I changed my mind. In the ten years I was there there were 100 acres that Hon. David Reesor had bought to make a deer park of, but he gave up the notion, and I bought that of him, and moved on to it. I put out 500 Spy trees and 1,000 plum trees. I found a difference in these Spys, and I was convinced that there were two different kinds of Spys. I have heard many a man say, going up the road, "That man is a fool; he will never make a living there, he will starve." but I have not starved, and I never missed a meal, and the place is paid for, and there is not a cent against it, and I have a little besides. I have fruit houses on it, and a barn and a stone cellar. I tell you there have been lots of drawbacks, but we can grow fruit there if we work; we won't get it if we do not work; I know that. I went across to England last year. I had not been across for forty-two years, and I saw there some fine Spy apples that were sent from there on the 23rd May, and they seemed to be just as fresh as ever then; so our quality of apples will be all right. When I got to Northampton I went to see the Mayor. He had about 200 men, and is a wholesale and retail fruit merchant, and he said, "I do not know that we ever got any fruit from Canada, but we have got some splendid Spy apples here; come and I will show you." I saw them and said, "Those are not Northern Spys." He said, "Oh, yes." "Where did they come from?" I asked. He replied, "Tasmania!" They were as green as any Mann apple I ever saw, but they were boxed up beautifully and looked nice. I sent 12 varieties of apples to Baron Rothschild, and I got letters from him and the Duke of Bedford and Lady Duncan Stuart; they said they

never saw such apples in their lives, and did not know there were such apples grown in the world. I tell you we do not advertise enough; they do not know what we have got; they have no idea. We have ravines up and down the side of this place. I have some of them in cherries, some in plums, and I have got every inch of ground that I can possibly put into fruit. I say, "I will not plant any more, I think that will do me." But, nevertheless, I generally get 400 or 500 trees every year and put out; I am very nearly 70 years of age now, and I suppose I will put out trees if I live to be 90. I have another hundred trees coming in the spring, although I generally plant my trees in the fall. Three years ago I was offered $3,010 for the apples alone on the trees on that 36 acres, and I told them they would have to pay for their board too. (Laughter.) I always charge the man that buys the apples for his board; then he gets away quicker. (Laughter.)

Mr. Caston: How much did those apples actually amount to that year on the 36 acres?

Mr. Cox: Well, I have never told anyone really that, but I made a little over $4,000 out of the apples, and I had only paid $4,500 for the place. (Laughter.) Another man had bought the place and could not pay for it. If any man puts out an orchard and thinks he is going to have an easy time of it and make a fortune he is very much mistaken. I went to look at a farm for a friend of mine, and the lady said, "You know we have come to these 28 acres; we have sort of retired." I said: "Retired in an orchard?" She said: "Yes, we had 200 acres, and sold that and thought we would come here and rest easy." I said: "You have come to the wrong place, to a fruit orchard, to rest easy. If there is any place where a person ought to be active it is an orchard: I can hardly sleep at nights." This year we had a light crop, about 400 barrels of apples, and we should have had 4,000 more than that. The peaches, apricots, cherries, and plums were immense; I never had anything like it. Yes, we grow peaches there, too.

EVENING MEETING.

On Wednesday evening more addresses of welcome were given by representative public men of Cobourg and vicinity, Mayor Huycke, Warden Rickard, Senator Kerr, and Mr. J. B. McColl, M.P. To these very interesting and eloquent addresses a suitable reply was made on behalf of the Association by Mr. T. H. Race of Mitchell, an ex-President of the Association and a former resident of Cobourg.

COMPARISON OF CANADIAN AND AMERICAN FRUITS.

By Prof. Van Deman, Washington, D.C.

After a reference to the good feeling existing between the two countries, the speaker proceeded to say: Down at Buffalo we were associated all this past summer with some gentlemen that I see before me here, and I shall look back to that time as long as I shall have the use of my mind as being one of the pleasantest friendships that I have ever yet made with these very Canadian people. I have been asked this evening to talk to you something about the comparison of your fruits with those of our own country, and as I look at the question I can say that I see very little difference really between the fruits of Ontario—and I may include Nova Scotia as well—and those of our northern States, particularly the New England States, New York and Michigan. Of course when we go farther west and south there is quite a change, but in the territory mentioned we grow just about the same fruits as you; and I may say—and I say it with all candor—that I think that your apples and peaches and pears and grapes and the berries—I guess that is pretty nearly the whole list—are just as good as any that grow anywhere in the world. (Hear, hear, and applause.) Your Canadian apples are as good as any that I ever tasted or ever looked at. Perhaps there are some in the far west that are a little more hand-

some, but take it all in all, your apples ought to bring, and do bring about the very highest price of any that can be sent to market from any part of the world. I have never travelled in Europe, but I have had apples sent to me from there when I was in our Government service, and I have seen them elsewhere, too, from England and from France and Germany, and from Tasmania, and I say that North America is the home, above all homes, of the apple—(hear, hear)—and while they do grow some very good apples in England, still when we send ours over there they will pay a better price for our apples than they do for their own. That is true ; and why ? It is because they are better. Now, these banners representing medals have been referred to. I am happy to say that every one of those I awarded myself—(applause)—and I did it only after the most painstaking examination of every exhibit that came in. I am certain that those who are here who had charge of the Canadian exhibit, and who managed it so ably—(applause)—with Mr. Bunting as their chief—and of course the other officials of this Association were back at home gathering up and sending forward—will testify to the fact that every one of those medals was awarded only after careful examination of all that you sent there. I am proud to say that the Province of Ontario came only next to the State of New York—(applause)—and of course you would not expect but that New York, being right at home, and with an ample fund behind it, would make the largest exhibit at the Pan-American. But you Canadian fruit growers have reason to feel proud of what you did at Buffalo. It was a beautiful exhibit from first to last. There was not a day when the Canadian fruit tables did not look very well, for I was there every single day but three and a half from the time the Exposition started to the close, and I know that the Canadian exhibit was first-class. (Hear, hear.) Now in making comparisons I may mention some differences which exist on our own side of the line, as suggested to me by your Secretary. The eastern people have long been thinking that they ruled the apple market, and so they have. Western New York, for instance, has for a good many years largely ruled the apple market of the United States ; they have exported more to years largely ruled the apples market of the United States ; they have exported more to Europe than any other part of the country. But the Western States are coming to be a very important factor in the fruit commerce of the country. Their apples are now coming eastward, and they are of such a high character as to color and size that they are making the eastern folks prick up the fruit growers from Rochester when he was looking at the fruit from the Territory of New Mexico, not yet dignified as a State. He said to the gentlemen in charge, "Now we are not afraid of you, but we are afraid of your fruit. When I see such a display of apples as this from New Mexico—and you say that you can raise them there by the carload or by the trainload like that—it makes me feel that maybe I had better sell out my farm and move out West and go to raising apples out there." And that is a feeling that is growing in the United States. I do not know that it is growing so much in Canada, because when we go westward into British America we go chiefly into the mountains and though I have never had the pleasure of travelling through British America, still I know that your territory there for apple-growing is comparatively small, or for fruit-growing at all. I have been invited by the C. P. R. to take a trip through there next summer, and I mean to do it ; I want to see what is going on there, and what the prospects are, and I want to visit Nova Scotia, but I have no doubt that I shall find a great many things there that I do not expect to see, and that is what I want—to broaden my scope, and to know better and better as time goes on just what we are growing in this great country of North America. The region of what we call the Northwest—that is, Oregon, Washington and Idaho and a part of Montana—is at the present time becoming one of the best apple-growing regions of the United States. The trees come into bearing there very much earlier than they do in the Eastern States. They bear much more profusely when they do begin to bear, and in fact one of the great troubles is that they bear too well; they load the trees too heavily, so that it shortens the life of a tree. Why the profitable life of an apple tree in the State of Kansas and Nebraska scarcely ever exceeds 25 or 30 years. The apple trees began to bear out there so early that I am almost afraid to tell you how early they do begin. I remember the biggest laugh I ever

raised was at Rochester, N.Y., at one of the horticultural meetings. I was talking about this same subject, or something like it, about how early some trees begin to bear in the orchard of Judge Wellhouse, who is called the Apple King of America, and someone asked, "When did they begin to bear ?" and I said, "The same year he set them out." Now, then, he got one apple from a tree—he got two or three bushels of apples from trees he had set out that same year. It is a common thing in Idaho and Washington for trees to bear the second and third, and surely the fourth, year from the time they are set out. They would be surprised if their apple trees did not bear in four years. I take it the same thing exists in the southern part of British America. Of course Prof. Saunders has travelled over there and knows.

Prof. Saunders : That is so, sir.

Prof. Van Deman : I know that is the case, and while you may not have much to fear, I do not know how much you have to fear. We want to take a little tip from those western people, and that is about the kind of fruit we pack and ship away. There has been something said about that law of gravitation in an apple barrel, and I think that is one that needs to be pretty well shaken up, too. We want to fix that apple barrel so that there is no evidence of gravitation in there at all. We want to have as big apples in the bottom of the barrel as we have at the top, and that is just what those western people do—they have their fruit running through the box all the same, and they do not use barrels at all. (Hear, hear.) I think that is a better way ; I think a box is a better package than a barrel. (Hear, hear.) They have them all alike just through and through ; I have never seen any variation or deviation from the rule of even grade of fruit from top to bottom. (Hear, hear.) They have them all alike just through and through ; I have never seen of stuff down at the bottom that there is in the top. ("That is right.") It does not pay to try to cheat somebody else, because when you do you are simply cheating yourself. perhaps not in that particular case, but in the end it will be a losing game on your part. That is the doctrine that will be preached, and preached until people find out that it really does pay to do right a good deal more than they do now. Not that everybody does wrong, but there are a great many that do, and that is one of the things that we want to take account of when we think of those western fruits; and if we will catch on to this box business, too, I think that is another thing. I do not know how much of that you are doing here in Ontario, but I know there are some who use boxes for packing fruit, and I think it is the best package, while of course that is a thing that will have to work itself out. The markets themselves will prove what is best for you to send, but I advise everyone who is shipping to at least make the trial of the box instead of the barrel. Now there are two or three things that I think you can gain by a comparison of the eastern and western methods, and one is the manner of growing the trees. As a rule in the Eastern States they want to train their trees so high that they can run a horse under without ever touching the hames of the lowest limb. Now I think that is a very great mistake. Of course the western climate is not the same as the eastern. They have more snow and more wind, and the soil is somewhat different, and they have several problems that we do not have in the east; but at the same time I think we ought to lower the heads of our trees more than we do, as I think that you ought, and I think that the best orchards I have seen in the Province of Ontario were those which were trained rather low. Of course you would not grow a Spy the same as a Talman Sweet. You must have a spreading one lower than one that has not a spreading habit. Then there is another thing that they do west that we do not do as much as we ought, and that is to prune back, especially the peach tree. Such growers as Mr. Hale of Connecticut, and Mr. Morrill of Michigan. and some of those men who are really the criterions of the business, constantly prune back their peach trees. They do not skip a single year but they keep cutting back so as to head the trees rather low, and a large part of the fruit is gathered standing on the ground. I know orchards in which the step-ladder is not used at all ; they never use anything more than a little bit of a hook that they reach up and bend down the branch with, and once in a great while they have to stand in the forks of the trees and gather the peaches. Then there is one thing more that they do

that we do not do, and that we ought; I refer to the thinning of fruit. The thinning business began in California, and, as I have said in various State horticultural and other meetings in our own country, if we expect to beat the Californians in our own eastern markets we have got to beat them at their own game—to take the same plan that they do exacly. Mr. Hatch of California, one of the largest peach growers that ever planted trees there, experimented from year to year until he found out just the right distance apart, according to his conditions, to grow peaches, and he found out that the width of a Chinaman's hand—they use Chinamen there for laborers—was the right gauge, and he never leaves the peaches so close that the hand would touch them on both sides. Mr. Morrill of Benton Harbor, Mich., has increased the distance to ten inches for his high grade peaches, and the consequence is that Mr. Morrill has sold peaches for figures as high as $7.50 a bushel. Of course that is an extreme case, but he has sold a great many peaches at that, and Mr. Hale of Connecticut had six inches for the distance for thinning his peaches until within the last year, when he said he had raised it to eight. We are just beginning to learn that we should thin out our fruit and not grow so many seeds. There are lots of fruit growers who, when you come to think of it, are more in the seed business than in the fruit business. (Laughter.) Do you know that it costs the tree more vitality to make the seed than it does to make the flesh around the seed. The principal ingredient in the fleshy part of the fruit is water, and the seed contains the potash and phosphoric acid, the highest mineral elements to make the fruit, so let us grow more fruit and less seeds. Regarding those people who are training their trees away up high, I have sometimes thought they were in the forestry business instead of in the orchard business. I have seen apple trees in the State of New York that were twenty feet high before you came to the first limb. Now that is nonsense, that is folly, growing such apple trees as that. Why, they do not get anything but a few little scurvy things away up there that nobody can climb high enough to get hold of. When we want to thin an orchard that is too thick, instead of cutting off the lower branches let us take the heroic course and clean out a whole row, and if necessary go both ways, and take care of the rest of the trees, and get more profit out of the one-fourth that is left than out of the four-fourths. (Hear, hear.) That is one of the things that they do in the west—they grow their trees so low that they can gather the fruit easily, and they train them so and cut them so that they have plenty of room to grow sideways, usually leaving rows wider east and west than they are north and south. I think that is the preferable way; and then they thin the fruit so that they have fruit to send to market instead of seeds. (Applause.)

OUR FRUITS IN THE BRITISH MARKETS.

By J. W. Robertson, Commissioner of Agriculture, Ottawa.

After some introductory remarks regarding the relations existing between Canada and the United States, and the possibilities existing for development in this country, the speaker proceeded to say : Every man who knows what life means knows the value of meditation. I have known people who were so trained to read that they read all the advertisements in the papers as well as the news. They get something before them in the train, at the office and in the parlor to save themselves from the vacuity of one's own company. Let a man begin fruit-growing and he will begin and think, think, think. Capital ! Then he will read with more interest and more profit. Then I want to say this, further, that he will have to get a wider knowledge of nature and plant life and insect life, and also of climate. In that way he becomes a man whose common sense is widened, and whose fairness and judgment are greatly increased, and those two things make for happiness and good citizenship. I would like to see that same sort of thing at the bottom and beginning of our school system. It is coming in England, Germany, France and every country that is beating us in the markets. We don't

care about being beaten in our intellects and social life, but when we are beaten in the markets it will waken us up by the practical quality of the education of our youth. In Germany they have two thousand gardens where boys are trained to grow fruit, develop observation and reflection and exact knowledge of nature, and learn all about them. To grow fruit and market it every man needs knowledge; not merely knowledge, but practical personal ability. Whoever could make a thing grow well, the apple tree the shape of his thought, the apple itself partaking of the quality that the climate will permit, could not do this unless he had practical ability ; and what is the use of him having these things to represent them, the examination ?—because life does not set a man an examination, it sets a man a task and says, "Do it or —— !"—(laughter)—and a man does not get a chance if he fails the first time. People will say somehow he didn't get on. Ah, you did not get another chance ! And that practical personal ability to manage a flower, manage a plant, or manage something for oneself gives you a responsibility and ability that is good anywhere, whether it be in the market or in the field of South Africa, where the Boer has shown personal practical ability to our shame. The indivdual man, with his personal practical ability, and sense of responsibility that made us send ten men to one to do the job at the command of justice and righteousness ! We had right on our side, but he had practical personal ability on his, and we should have that in our country, and fruit-growing would help us out of it. Then we want co-operation between the fruit grower and the fruit transportation companies and the fruit salesman. How does that affect our fruit business ? Take the home market, and my friend from the United States has very clearly said that the western fruit grower puts the same kind of fruit all through his package, and I go to Winnipeg and the men there say, "We would not have Ontario apples if we could get them from Washington, because the Washington boxes are the same all the way through." I did not say that, but the Winnipeg merchants drum it into me every time I go to the city, and back it up by sending me long letters. Co-operation is good for the man who packs as well as the man who eats, and it would pay us to have our fruit of a poor quality, for some poor fruit grows on trees, but have that fruit the same all through the package. A man is satisfied if he gets it all of the same value. That co-operation would help us to capture our own markets, that are slipping from our grip in the Western Territories of our own country, just because those people say that packages from the States are the same all the way through, and ours are not ; and I have seen some of them to back up their statements. Then what shall we do about the English market ? The same thing is true there. If an Englishman wants a good thing he will pay a good price, but he wants it the same all the way through. Now we do send a lot of good fruit to England. I tell you what happened this year. The Secretary of the Canadian Commission to Glasgow Exhibition went down to the fruit bazaar to get three specially good barrels of apples, good Canadian apples. He had the fruit of last year kept over in cold storage, and specially selected and specially sent over—I think Dr. Saunders looked after that—and it was admirable, in splendid condition when I saw it in June and July, but he sent down some time in October for three barrels of specially fine apples to bring up to the members and show them, and they said they got three of the best barrels that Thomas Russell could give them in the bazaar, and every barrel of them turned out to be filled with rubbish in the middle ! They got the names of the men who shipped them and the brand of the barrels. I am not publishing them here to-night, but there were three barrels picked on purpose to show to distinguished guests and to show that the Fruit Marks Act was enforced, and those marks were on those three barrels; very likely the only three that went out of Canada this year—(laughter)—so the terrible swing of the eternal came home, as retribution for wrong-doing comes on us. Those three special barrels just turned up opportunely. It was not much to brag about in the Glasgow Exhibition, especially when those old Scotchmen over there, who have a great regard for profits and honesty—especially honesty on the part of the other fellows—weighed out of the middle of those barrels certain quantities, and had them photographed and sent to me, with evidence that they weighed eleven apples to the pound. (Laughter.) It was not creditable. I tell you it has made me whistle small in Scotland about Canadian apples. People will

say that some few accidents will happen in a new country, but when these men rub these things into you when you are speaking of the expansion of Canadian trade it makes you wince. In sending fruit to the British market it is not wise to send many varieties at one time. I will not trouble you now with a list, but will put them in the report. They say, "Never send more than 12 or 15 varieties, and you will get more money." If a man will send 50 barrels of one well-known good variety, well packed, he will get 5 shillings a barrel more than he would get for 50 barrels of assorted fruits of any known variety, or all kinds mixed up. That would pay handsomely in one sense, and might be a loss in the other. We send too many varieties. This does not apply to pears, because often as good prices have been got for Keiffer pears as for any in their own season, and when the Keiffer pear is picked at the right time, and is dead ripe when it is eaten, it is not a bad sort of pear, no matter what people say about it—(hear, hear)—and I have seen some Keiffer pears this year that looked splendid on the skin as well as good to eat inside; and, at any rate, if an Englishman for any reason satisfies himself and wants to buy that pear for a good price I have no objection till he gets trained up. (Laughter.) I want to say a very few words about packing for the foreign market, and the picking Our people have not yet observed closely enough to pick out varieties at different stages of ripeness. Now if a man lets a Bartlett pear go as far on before he picks it as he must let a Keiffer pear go on before he picks it, the Bartlett cannot get to England by any device of transportation, and that direction about picking at the particular degree of ripeness needs to be observed. The same is true of apples. Then sorting and growing and packing are exceedingly important things to know. I will just emphasize two points now. We need skilled men to pack for safety in carriage. No matter how honest a man may be, if he does not know how to pack he will spoil tender fruit for safe carriage; so we require skilled men for safety of carriage and honesty, both for direction and action, for the sake of satisfying the consumer that he gets exactly what it is represented to be. Now those two things, which we should have over the whole country at large, would make more progress in one year than we have made in the last five in the apple industry, because at the threshold of commercial success, as far as I have scanned the growth of enterprise in this country and other lands ,lies this commandment, "Thou shalt deliver goods of the sort and quality that they are represented to be." (Hear, hear, and applause.) That is at the very threshold of all remarks. And the second commandment is like unto it, "Thou shalt deliver it in the best possible condition." A baker in Glasgow who grew very rich was once asked by a neighbor, "Geordie, how did you come to make so much money ?" to which he replied, "I never tried to make money; I just tried to make good bread, and the money made itself." (Applause.) It is getting on these fundamental principles and standing on them and living them out that means prosperity for Canada in regard to all its business, and particularly now in regard to this fruit export trade. Then what is the use of calling something by a name different from its own? What gain is there in calling a barrel of poor apples "Extra Finest XXX" ? (Laughter.) Will it make them better ? Just for the sake of argument, for the sake of custom, we call them that. It is exceedingly faulty and poor policy to call a thing by another name than its own, the one that belongs to it and defines it and designates it. I think people sometimes forget the meaning of one great leader's advice. Abraham Lincoln was one of the great men. Once a great deputation came to him in times of trouble, and were very plausible, and made out a great case, and said a great many things that sounded well, but did not seem to be quite so. "Old Uncle Abe," as they called him with most reverential familiarity, said something like this, "Well, gentlemen, supposing a man should go to your place and begin to make you think that some things that you thought were not so were so, and they would say to you, "Now supposing, for the sake of argument, we will say that in the case of one of your cows that her tail is her legs. Then how many legs would your cow have ?" "Five." "Then, gentlemen, I have to say I am obliged to you for the kind information you have laid before me, and I shall consider it: and now go home and go to the cow stable and see if the cow has five legs." charming way of saying that you might call a tail a leg, but it does not make it anything but a tail ? (Laughter.) So the branding of some barrels of apples "Extra Finest XXX"

leaves the apples inside just as they were. But it didn't leave the man who put the brand on quite as safe and solid as he was before. That is where the damage was left to threaten the country and its commerce. (Hear, hear.) Then the extent of the home market is quite large. We give the United States and their markets an opening for about $400,000 worth of fruit of the same sort that we grow at home. You can just meditate on that if you want to. We buy from the people of the United States, because of their business mainly, if you will, to the extent of $400,000 worth a year of the same sort of fruit that we grow at home. I do not include oranges and bananas and those sort of things at all, but $400,000 worth of fruit such as we grow at home, we allow them to supply for home consumption. At the same time we send to England about a million barrels a year, and England imports twice that many from other countries. So that if you want to get a bigger share of that market you will have to send rather better apples, not in quantity, but in regard to the contents of each package, and we will gradually win our way to as large a share of the English apple market as we have with other products. I will only say this about pears, that the markets of England in pears come to $1,300,000 a year, and we have grown from nothing in 1897 up to over $400,000 a year now, so we are making some progress in that respect. The transportation, of which I shall speak to-morrow, is the great point that seems to be discussed, but it is not the important point that means success ; but to show you how badly we get on in regard to the sale of our apple trade from packing and transportation let me just cite a few figures :—14,000 barrels of apples on seventeen ships, 185 lots—a pretty large basis on which to build a conclusion—out of 14,416 barrels there were less than 6,000 barrels tight and in good condition in the market. The faults were : Slacks, slightly wets, wets, wets and slacks. Of the 14,000 barrels, nearly 3,000 were slacks, and they sold for 2s. 7d. a barrel less than other barrels in the same market at the same time. Then the slightly wets came to 3s. 8d a barrel less, nearly a dollar a barrel, and there were 2,500. Then of the wets there were nearly 2,000 that sold for 7s. 3d. (that is $1.75) a barrel less. Of the wets and slacks there were 1,250 barrels that sold for 9s. 11d., or nearly $2.50 a barrel less than the other apples of the same sort in the same lots that were landed in first-rate tight condition. Now that is a rather pitiful state of things; and that is a common occurrence in the auction sales at Liverpool, Glasgow and London, because I am giving you now the records of seventeen different ships and 185 lots. It was rather better this year because there had been an improvement in the cold storage, and a safer and better transportation on the ocean, which I shall discuss to-morrow. The relation of the Department to this, is a matter of some moment; but to show you something that is being done in this direction, just to give you, in a general way, a notion of the progress we are making, of ships leaving Montreal this summer, our Department officers examined and reported upon, carefully, not less than 204 sailings of ships from Montreal, not 204 different ships, but from the first of June 204 different sailings. Of those there were 96 sailings with good cold storage, that is, cold storage for butter and tender fruits; and then there were 12 sailings with the improved circulation of cold air at 45 to 50 deg. circulation in the chambers where cheese and apples were carried, and then there were 77 sailings where ships had the latest and best make of exhaust fans. This Association, ever since I came before it, has been urging on the steamships and Department to get exhaust fans for circulation, so this year 77 sailings had these of the best sort, and 96 sailings had improved cold storage of the best sort. Altogether, there were from Montreal no less than 340,000 cubic feet of space this last year, without counting one big ship that came into traffic with 200,000 feet. That is enough for all the cold storage accommodation for Canada.

J. F. Hanrahan: Can circulation be produced by the use of a fan in a chamber for the elimination of the odors and gases from the air ?

Prof. Robertson: Well, if you had a fan it would make the air move.

Mr. Hanrahan: That is not the question. I want to know if you can produce throughout the chamber a complete distribution of the air obtained by the use of a fan for the elimination of the odors, gases and moistures from the air, or the odors and gases generated from the product?

Prof. Robertson: Well, first of all, I do not know that there is any gain in eliminating the smell of apples from the chamber where apples are carried. I do not see any gain in eliminating that myself. I think it is rather a pleasant thing to be there. There is nothing harmful in the odors as far as I know.

Mr. Hanrahan: Nothing from the moisture?

Prof. Robertson: Oh, yes, that is another question. By the circulation of air the moisture is quite pumped out, and the chamber is thoroughly dry, and the cold storage chamber is so thoroughly dry that you can strike a match anywhere on the sides, and we have 450 cold storage buildings in Canada of the same sort.

Mr. Hanrahan: That is not true, because you have only mechanical cold storage on the ships to-day, that is, a series of pipes on the four walls of a chamber, and when extremes exist circulation cannot take place.

Prof. Robertson: I shall be most delighted to-morrow to discuss the whole question of cold storage, and to discuss the kind of cold storage we have on the steamships, because the last two years they had very good cold storage on the steamships, and they are sending also peaches and pears from California by our route in order to get them in England safely, and getting capital prices, so, without any apology to anybody, we have the best system of cold storage in the Canadian ships that is anywhere to-day afloat on the ocean. And we have what is still better. I was just going to say we have now this last season five steamships fitted with a special cooling plant to cool the air, and a special drying plant to dry the air, so as to pass that through to places where cheese and apples are carried; and we are now negotiating with them for that on seventeen more steamships. So we are a good way ahead of other countries in ordinary cold storage, and we are quite ahead in having this refrigerated air distributed through these chambers. Now the only other thing I have to say in regard to the English market is this: The Department has four men always on the other side who are all the while watching the discharge of ships from Canada. The Department has these to depend on for its information. In Montreal we have three men whose business it is to report on the putting of goods on board the ship, and if anything is wrong to see to it at once; and in the last two years we have made such progress that the people of other countries are going to get our plan and to ask these disinterested agents to give them information. These four men have been giving us the most valuable information in regard to apples, and sometimes the apples will get in the hold beside the boiler. That happened once this year, but I will venture to say that it will never happen again with that line of ships, because if that is published with the rebuke of the Department, shippers will never use that ship line again; and now they promise that at both ends we will have the service that we have been seeking in all these years. We are making progress by making efforts in every quarter, by getting comprehension of the methods, and then by co-operation all pulling together. I would like to take the full session of this Convention to-morrow forenoon, because I came this time particularly on purpose to correct a great many misapprehensions that have been sedulously published over Ontario regarding the effect of cold storage in the steamships, and to-morrow I want to put documentary evidence before this meeting to show the character of that campaign and the character of the cold storage we have, and that it is abundantly satisfactory, and that if it is not satisfactory the Department has said to me: "Go and get a better; and we will do that next year"; but I am unwilling to stay longer connected with this Association and its work unless I say to-morrow some plain things regarding the whole campaign of the last two years about cold storage in Ontario and on the steamships from Canada; and so I would like that you would have to-morrow a full attendance, and then I will answer my friend all about the elimination of gases and all other noxious things.

FINANCIAL STATEMENT.

The Secretary-Treasurer read his report for 1900-1 as follows:—

Receipts.

Balance on hand Dec. 1, 1900	$ 281 17
Membership fees	4,634 25
Government grant	1,800 00
Advertisements	301 45
Samples, etc.	10 40
Binding and bound volumes	8 90
Total	$7,036 17

Expenditures.

Canadian Horticulturist	$2,592 43
Salary Secretary-Editor	1,200 00
Commissions	750 55
Premiums	481 11
Illustrations	320 11
Annual meeting expenses	300 65
Bookkeeper	240 00
Reporting	188 40
Postage and telephone	157 27
Printing and stationery	118 80
Affiliated societies	117 72
Committees and delegations	95 20
Express and freight	39 38
Auditing	21 00
Collection and interest	19 57
Book binding	14 95
Books	4 00
Total	$6,661 14
Balance on hand	375 03

We, your Auditors, having carefully examined the books and vouchers of the Secretary-Treasurer, desire to report them correct.

A. H. Pettit.
George E. Fisher.

The President read the Finance Committee's report as follows:—

Grimsby, Nov. 25th, 1901.

The Finance Committee beg to report that we have carefully gone over the expenses of the year, and find them in accordance with the best interests of the Association, and we desire to express our appreciation of the highly satisfactory manner in which the books and accounts have been kept. We are also pleased to note that there is a reduction in the expenditures of the year.

W. M. Orr.
W. Pettit.
A. M. Smith.

Colonel Rogers moved that the report be accepted and confirmed.

Mr. Huggard seconded the motion.

A. H. Pettit: I have to state, on behalf of the auditors, that we have examined the books and vouchers of the treasurer and found them to be perfectly correct in every respect.

E. D. Smith: Would it not be as well to place the members in closer touch with the Association by having the financial statement printed and distributed? There are so many items that on hearing it read one cannot criticize it intelligently. Of course we have faith in the Finance Committee, but it seems to me it would be more satisfactory if the members could look more carefully into it, and possibly some of them might suggest some changes for the new year. I would move that at the future meetings a copy of the financial statement be placed in the hands of the members before the matter is brought up to be voted upon.

The motion for the adoption of the report was carried.

Mr. Smith's motion was seconded by Mr. Tweddle and carried.

PRESIDENT'S ADDRESS.

BY W. M. ORR, FRUITLAND.

The following address, which was read by the President, also constitutes the report of the Directors and Executive Committee.

This year has been one of special progress for our Association. Notwithstanding the increased expenditure in some directions, we have a good balance in hand, which reflects credit upon the management of our affairs. The continued increase of our membership shows that our work is appreciated on every side, and that our friends are yearly increasing in number.

Our journal, the Canadian Horticulturist, is a prominent feature of our work, and, therefore, we will call attention to it first. During the year we have kept it up to the 48 page limit, which in previous years we were not always able to do. Its circulation among horticultural experts, as well as among farmers, is gratifying, showing that it has a high standing among horticultural journals. We have made free use of photographs during the year in illustration, and have arranged to use a colored plate in the January number, 1902, and occasionally thereafter. The editor is making special efforts to increase its efficiency and circulation.

We are gratified to find not only horticultural societies taking the journal for their whole membership, but we have also inquiries from Farmers' Institutes inquiring on what terms they may have the journal for their members, and offering to pay 25 per cent. on each subscription, providing we could make a reduction of a similar amount. We have replied favorably to this, making the provision that these subscribers could not expect the premium plant, and we hope soon to make a proposal which will meet with the approval of all our Farmers' Institutes, and bring thousands of farmers in touch with us, so that they may have the full benefit of our publications.

The annual report of our Asosciation is now placed not only in the hands of our own members, but also in the hands of every member of the Farmers' Institutes. About 35,000 copies are printed.

We have also begun to take advantage of the prize lists of our Fall Fairs, and in some cases have offered one year's subscription as a prize. This has been accepted so gratefully that we propose to you the advisability of offering this to all the Fall Fairs in 1902. It would help very much to advertise our work.

Throughout the year we have been printing about 5,600 copies of the journal.

The interest of our local horticultural societies has been well kept up during the year. Although the lecturers are no longer sent out directly by our executive, yet Mr. Creelman, who has the work in charge, is desirous of working in close touch with us, and has sent the lecturers to talk over matters with us, so that in their visits to a locality they may work in harmony with us. It is true many of these societies primarily consider floral topics, yet they are equally interested in the fruit garden, and, wisely conducted, they will prove the greatest source of strength to our work. Through the efforts of Mr. Thos. Beall, our organizing director, these societies are constantly increasing in number.

Our finances, as you will see by the report, are in a good and satisfactory condition. Our growing work has neecssitated a little more expense in office work than formerly, but not more than was rendered necessary by the increase in our work.

The plant distribution last spring was larger than usual, and cost the Association $480.33, or about $50 less than the year previous. This, as you will see, is only about 10 cents for each member, a most reasonable amount when we consider the size and quality of the plants sent out. We have usually ordered these plants from Messrs. Stone & Wellington, because they offer us the best terms; and certainly, during the last few years, we have had very little complaint over the premiums. We sent out in all 2,399 plants of the Spirea Anthony Waterer, and 4,018 plants of Cumberland raspberry.

It is with a feeling of pardonable pride that we refer to the magnificent display

of Ontario fruits at the Pan-American Exposition at Buffalo during the past season. The extent and excellence of our display was a surprise to our American cousins, and a source of gratification and pride (patriotic pride, of course) to every Canadian who visited the horticultural building.

The exhibit of apples of the crop of 1900 demonstrated the great possibilities of preserving fruits in cold storage from year to year in perfect condition, proving that, in years of heavy crops the fruit need not be sacrificed nor wasted, as it was in 1896.

Ontario has made a splendid record, and one that has made an impression upon the American people. We captured for fruits 19 gold medals, or one-sixth of the total number awarded; 33 silver medals, or about one-sixth; 35 bronze medals, or about one-fourteenth; 85 honourable mentions, or about one-fifth.

Of the gold medals, eleven were to the Province of Ontario for collections, and eight to individual exhibitors. The judges placed Ontario's fruit exhibit first in quality, and second only to New York in variety and quality.

All of which, I submit, is exceedingly gratifying to the people of Ontario, and reflects great credit upon Superintendent Mr. Bunting's ability as an organizer and manager.

In the competition for the Wilder medals offered by the American Pomological Society, whose membership covers the whole of America, we captured three out of fourteen silver medals, and one bronze out of eight. There were no gold medals offered. Every entry made from the Province of Ontario scored.

Transportation is a subject of vital importance to the fruit growers of Ontario. When the shipping charges on a consignment of fruit amounts to more than the value of the fruit, as is frequently the case, it is time to investigate, and I would suggest that this Association should consider the advisability of passing a resolution asking the Dominion Government to appoint a Railway Commission, to whom all questions of transportation and freight rates could be referred for adjustment.

We wish to express our appreciation of the horticultural work done at the Dominion Experimental Farm at Ottawa, at the Ontario Agricultural Farm, Guelph ,and at the thirteen Fruit Stations throughout the Province. We would also suggest that this Association should consider the question of approaching the Dominion and Provincial Governments with the request that an Experimental Fruit Farm be established somewhere in the fruit belt, where not only the testing of new varieties should be carried on, but the originating of varieties especially suited to our climate and markets. Such work is highly important, and, as far as I am aware, is not being carried on systematically or extensively in the Province. The production of a single desirable variety of superior shipping quality would outweigh the cost of many years of such work.

The San Jose scale, the most insidious enemy the fruit-grower has to contend with, is still a sourse of alarm, and continues to spread and do its work of destruction in infested districts. We realize more than ever the serious danger from this insect, and that, if it is not controlled, successful and profitable fruit-growing will be impossible. In this connection, a deputation has already waited upon the Minister of Agriculture for the Province, asking to have the Noxious Insect Act so amended as to allow municipalities to appoint inspectors, whose duty it would be to examine all orchards, and endeavour, if possible to prevent the spread of the infestation. It is proposed that, as this is for the public good, the Government should bear two-thirds of the expense and the municipality one-third.

The question of bandaging of trees for the destruction of the larvae of the codling moth, and the experience of the Township of Saltfleet, where the law has been enforced for two years, will be dealt with by Mr. Joseph Tweedle of Fruitland, a resident of the Township.

We regret that the cold storage for fruits during transportation cannot be safely relied upon by Canadian shippers. Although fruit prices were good in Canada this season, several growers, anxious to see the work of establishing our fruits upon the British markets continued, sent at their own risk consignments of pears. A serious loss was the result. Owing to the failure of the apple crop, fruit was scarce this season, and

the need of an outlet was not felt as it has been heretofore; but large orchards of pears have been planted within the last few years, looking to this market, and we fear that in seasons of a heavy apple crop the results will be disastrous to the pear grower unless this export trade is cultivated. No expense should be spared to perfect the cold storage and transportation system as quickly as possible, as experimental shipments of American Bartletts are being sent to Britain under the auspices of the United States Government, with the object to capturing this trade for themselves.

We would like to see the work on the "Fruits of Ontario" undertaken by our Secretary pushed to completion, so that we may have at hand a concise and comprehensive work on this subject for reference.

Although there was an abundance of fruit buds and bloom on apple trees last spring, the cold wet weather at the blossoming period prevented the fruit from setting properly, so that the apple crop was all but a failure.

Other fruits yielded abundantly, and prices were very satisfactory. The prospects for next year are all that could be desired, the trees and vines going into winter with a good growth of well-matured wood and an abundance of fruit buds in excellent condition.

Mr. Smith : We ought to appreciate very highly the efforts made by the Directors of this Association for the advancement of the fruit-growing interest during the past year, and the efforts of the Secretary especially in the arduous work that he has in connection with this Association. However, the point I wish to speak about is the paper. Many very good fruit growers have spoken to me at different times, saying that we should have a paper more in touch with the market, in fact, a weekly paper rather than a monthly, which is of little use so far as the markets are concerned. Of course, the first objection will be that a weekly paper is beyond our means. In answer to that it might be said that a weekly paper might be gotten up on a cheaper system, so that although it came four times a month it would not cost very much more than the "Horticulturist." In other words, that the expense that is put into the cover of the "Horticulturist" and into the fine paper and general fancy get-up of the journal, which is of course a pride to the fruit growers, be spent in giving practical knowledge to the fruit growers. It may be said in answer to that that three-quarters of the members of this society are not practical fruit growers, and that the paper is published in their interest as well as the fruit growers. However, it seems to me that sooner or later somebody will see that there is a great field for a practical horticultural paper published weekly. I do not know of a single such paper published either in the State of New York, Michigan or Ontario, and in fact in the New England States. Here is the northern belt of the Continent, and I do not know of any horticultural paper that appeals to the practical growers such as The California Fruit Grower, a paper which is published weekly, and which is of great advantage and benefit to the California people, but is not of much benefit to us here as they deal in different fruits. Now what would be the position of this society supposing that some individual should see a field for such a fruit paper as a private enterprise, supplying the wants of this northern district ? Would it not cut largely into the subscription list of the "Horticulturist" ? It seems to me that that is a matter that we ought to take into consideration. It is the wish of every member, I am sure, to see the society prosper as much as possible, but it has always seemed to me that there was something lacking in the society, that it did not come closely enough in touch with the commercial fruit-growing of this country, which is of more importance than that of the amateur, and that this society has not done possibly what it might have done in the way of assisting commercial fruit growers in getting better markets and marketing their produce in general.

Mr. Whyte : There is a great deal of force in what Mr. Smith has said, but it seems to me that we could get at that with very little expense by issuing a bulletin, such as the commercial agencies, on a sheet weekly and sent out by our association. The expense would be very small.

Mr. Tweddle: The interest of the amateur and the commercial fruit grower are so different that it is very difficult to unite them in one paper and satisfy everyone. I have been ashamed of my own apples, that I had not a better grade to pack and ship, and it set me thinking, and I have determined to cut off half the tree and secure decent ones from the other half, and in every other way to secure a better quality of fruit if we don't get half as much. I am sick and tired of growing poor apples. One of the best sources of information to help us out of some of these difficulties is this Reading Course for Farmers by the Cornell University. I have been studying over these lessons a little, and I believe they are the best thing ever put out, and I would like to see a deputation wait upon the Minister of Agriculture asking to have these lessons issued from the Guelph College, no matter what it cost. The editor of the "Horticulturist" has been publishing some of these Cornell lessons. In some way or other we ought to get this information from our scientific men at Government expense to help us out in every direction, and I would like the President to have this matter brought up later.

C. C. James (Deputy Minister of Agriculture): Do you refer to the leaflets on Nature Study, or those on Apple Growing?

Mr. Tweddle: As far as a resolution from this society would be concerned I say let it be Horticulture Study. Let the Farmers' Institutes bring up a resolution asking for their line.

The Secretary: You will be interested in knowing that in the December number of the "Horticulturist" Prof. Hutt of Guelph has begun a series of articles entitled "First Lessons in Fruit Growing." This will be continued during the coming year, which will be along the line Mr. Tweddle has asked for.

C. C. James: The first trouble is, of course, to get the material of the right nature, and it is very difficult to get that material to publish. If we could get the right material I think the question of expense of publication would be a very small one indeed. But where are you going to get the men to write these things? There are only one or two in America who can do it, but even if we have to take it to the other side, I suppose we will have to do it. The next question is, after you have got it distributed to get the people to read it. (Hear, hear.) The amount of printed matter that is going out in this country is something enormous; I think we are making very rapid progress, and if you were to put together all the material that is being published it would make a very large volume, in fact, two or three large volumes. The trouble is to get it just into the hands of the right men. We have in this Province 175,000 farmers. Well, you must not expect too much in a year or two years. I think the farmers are reading a great deal more than they ever did before, and if this Fruit Growers' Association can in any way at all put in our hands the right kind of material to publish, there will be no trouble at all about its being published and distributed. It is just exactly the kind of material we are looking for, if you can only find the right men who can write that material. It is an easy enough matter to write a difficult, heavy, ponderous bulletin; almost any man engaged in the work can do that; but to write a very simple bulletin, just along the lines Mr. Tweddle has been talking about, is the most difficult thing in the world to do.

Mr. Tweddle: I am very glad to hear what the Deputy Minister has said. I would like to state that in connection with the Cornell lessons, they send along with each lessons a little examination on that lesson, and if these questions are not answered in some way, or an attempt made to answer them, and sent back to the Department, that individual name is struck off the mailing list, and you can thus sift out your men who are hungering for this kind of thing, and it need not cost the Province one-tenth the amount it would to distribute this matter to 10,000 of the men who would not look at it. The Americans are far ahead of us in that respect. I think it will not do to admit before Prof. VanDeman that we have not the men here that can write these bulletins. (Hear, hear.)

C. C. James: It is an easy enough thing for a man like Mr. Tweddle to read these things and practise them, but the man who is mostly in need of it is the diffi-

cult man to reach. The man with the most neglected orchard, who is injuring not only his own orchard, but his neighbors' around, the trouble is how to get hold of that man.

W. L. Smith (of the Farmers' Sum) : Mr. Tweddle is a good deal nearer right than Mr. James in this particular matter. There is no difficulty at all in getting people to read this matter. During the last two or three years I have been in the houses of a thousand farmers, and I have been amazed to find the hunger for information and the manner in which it was received. The publications of the Agricultural Department are read to a much greater extent that Mr. James is aware of, and it is largely to his credit because he is interested in the preparation of it. There is no doubt that if the matter were properly prepared the people would read it.

Mr. C. C. James : I cannot cast any reflection on our own men, because a good deal of this work at Cornell is being done by one of our own men, Prof. John Craig—(applause)—and the Americans are always shrewd enough to pick up as many of our men as they can lay their hands upon. You will find that in certain plans that are being considered now for next year a lot of this literature will be distributed. At the same time, notwithstanding all Mr. Tweddle and Mr. Smith have said, the great problem is to get hold of that man who is less inclined to read, how to stir him up. Can we get him out to a series of meetings ? If we could send men forcibly through this country to clean out probably two-thirds of the useless apple trees, do it by force, we would confer a great benefit not only on those farmers, but on the country at large. We cannot do this thing by force, it must be a gradual educational, persuasive movement, and the question is how best to begin this ? Shall we gather together the farmers in the various sections and try to arouse their enthusiasm by talks from practical, hard-headed fruit growers such as we have here to-day, and then follow it up by leaflets, or shall we largely depend on the circulation of the bulletins and reports ? To my mind it is largely a question of how best to begin.

Mr. Tweddle : Prof. Craig told me that there were from 15,000 to 20,000 farmers in New York State receiving these lessons under the State grant, and that the State appropriation was all used up, and you must remember that those names were struck off if the farmers failed to send back the examination with some attempt at answering the questions. I think that that surely brings it down to a condition that it would pay well; there need be no loss in the dissemination of the literature ; it would all be read, what is sent out. We used to get these bulletins free from New York State, but now we have to pay for them, as the appropriation ran out, and if you educate a few men who will read, the practical commercial orchardists, the state of their orchards in a few years will be a better educator to the careless man than anything else, and it will be right before his eyes where he cannot get out of seeing it, and the education will be driven into him. I think that would be a cheaper way than to pull him out to a meeting, for he might forget it before the time comes for pruning.

Eben James : The remarks of Mr. Tweddle are very good, but in the five years that the orchards are getting into shape the loss to the country will be very much. Now the Farmers' Institute meetings take place all winter. Could not this association recommend that the Government send a man to everyone of those Farmers' Institutes and take the matter up ?—because I am convinced that people would have time then to listen to the matter, who would not read papers. Thereby we may get some results. If we do not take some active steps in the next few years the country will lose by it.

Mr. Morris : I hold that the farmers and fruit-growers do not at present get from the Government really what is due them in the way of expenditures. At the present time there is only provision made at the Guelph College for one or two students from each county. Those students go there, and if they are bright young men they get their education, and they are picked up by some college in the States and taken over there as Professors, and sometimes go to foreign countries. I would like to see our Government extend that institution so that we could accommodate perhaps twenty from every county, and adopt means to get that twenty to attend, and

each of those students when they returned home would be a teacher to all his neighbors. In that way I think you could educate the people more thoroughly than by any paper. A young man from the neighbourhood where I live, went to Guelph and on his return set such an example to his neighbours that he was worth a great deal of money to everyone of them, but unfortunately he died, and those who succeeded him were not his equal.

George Robertson (St. Catharines) : I suppose the reason that a great many farmers do not read bulletins is that half the bulletins that are published—I have reference to the bulletins on the other side of the line, because I get a great many of them—are not worth reading. As Milton said about preachers, preaching to congregations, "They are filled with wind and are not fed." The fruit growers read a few bulletins that are no good, and they judge all bulletins to be of the same stock. Some of them are all right and some of them are not. I have no fault to find with the bulletins published in Canada; they are just as good as the money makes them that is appropriated for the publication of them. I think we do not spend enough time or money in Canada to get men to give their full time and attention to certain lines of investigation. A man has to spend his full time in investigating one particular thing in order to get information.

Mr. Sherrington : I think that the move that was made by the Department last summer in the way of holding orchard meetings is going to be a greater means of disseminating knowledge to fruit growers and farmers than any other way that we have adopted in time past. We meet right in the orchard, the farmers attend more largely, and they are of the right class. They get an object lesson right there, they carry that, and remember it more clearly than they would by reading bulletins. I am a farmer myself as well as a fruit grower. I read bulletins, but is is impossible for a farmer to study with the head and do manual labour at the same time; but where he goes to these orchard meetings and gets an object lesson he will never forget it. Last summer we had one held at our place, Prof. Hutt was there. Before it was advertised a good many of the farmers said they were not going, and there would not be many there; but they could not resist the temptation, and 300 attended, and since that time many of them have told me it was the best institute meeting they ever attended. We got an object lesson on grafting and pruning, and they have been speaking about it all fall, and asking if we are going to have more such meetings. They have also asked why the Farmers' Institute men did not hold some summer meetings. We have weeds growing in the summer that we cannot identify, and we want to know how to eradicate them. At a summer meeting we could take up some of those weeds, and there would be somebody there to tell us how we could identify them and destroy them. These summer meetings should be held sometimes at a private creamery and another in a township hall, and so on, and thus we could reach the fruit growers and farmers and be able to take up different lines in that way quicker than we could by sending out so much literature. This work could also be done at the annual fairs, which are not in the least educative as conducted at the present time, simply because a farmer goes there and gets a prize if he can by hook or by crook, and gets his money and then goes away home, and there is nobody educated by it in the least.

C. C. James : I think you will appreciate at once the difficulties under which the Department with which I am connected has to labour. The first man wants a law enforced along certain lines; the next man wants our bulletins and publications very much increased ; the next man wants the agricultural college work extended, and the next man wants summer institutes. You see the variety of people whom we have to satisfy, and at once the difficulties that confront us most become very apparent. How are we going to meet all these things ? In connection with the last point I would like to say this : during the last two years the Farmers' Institute work has been very greatly extended, and we now have a series of special summer institutes. During the last two years we have organized special institute meetings in connection with the poultry work, and have begun special meetings for the women

on the farm. We had a few meetings last year for horticultural work at our fruit experiment stations, and we are carefully extending all these, and wherever we find that one line of work is proving successful the proposal is to extend it; and I simply want to say that you must not expect that all these lines can be developed at one time, because it means a very great increase of labour and in the demand for men. It is becoming a very great difficulty to get men who are suitable for this work, and that are acceptable to the farmers of this country. The farmers and fruit growers will not put up with institute workers to-day of the same nature that they would ten or twelve years ago. The men who go out to address these meetings have to be of a far higher nature—better men, better qualified for their work than they were ten or twelve years ago. Now this is a good sign of the times. Where are these men to be had? They are scarce. It is difficult to get a man who is a thoroughly practical man, a good speaker, and a man who knows not simply how to talk, but when to stop talking—(laughter)—and how to make his talking plain and acceptable. Talk is a good deal just like writing these bulletins. I would illustrate that by a little incident that I came across not a great while ago. One of the most learned men of England had put out a book, and at a banquet shortly afterwards he was complimented on it by a lady, who said, "Mr. So-and-so, I enjoyed your work very much, it was such easy reading." He replied, "Madam, easy reading is very hard writing." Easy, plain, instructive speaking at the same time is also very difficult. Now these men who are acceptable for that work are not very plentiful. They are being demanded by other departments and other Provinces, and they are being sent for by the other side. The fact that the United States sends over here for men to address Farmers' Institute meetings on the other side shows how scarce those men are; and if we cannot fill the field in all those particulars it is not altogether our fault; but the work is increasing so fast that the demand at present greatly exceeds the supply. I think you will find that a great improvement has been made in the last few years. I am quite free to admit that we are only beginning this work, and the work to be done in the future is ten times what has been done in the past, but there are great difficulties in the way and those of us who are concerned in the management of it are sometimes at our wits' end how to meet them; and if you have any practical suggestions how to meet them we will be only too glad to get them. If it is more literature you want I think there will be no difficulty in getting that. If it is more meetings you want, we will try to meet you. I will not promise we will develop the Agricultural College as Mr. Morris would like to see it. Is it not remarkable? A few years ago people were casting suspicious eyes on the Agricultural College, and at the work it was doing. Now, regardless of politics, people are saying that this work ought to be extended. The work has been extended. We put in accommodation this last year for fifty or sixty more students, every place is now filled, and the time has now come when we have to make special provision for horticulture. We have special courses in dairying that have been exceedingly successful. We have a special course, starting in January, for live stock judging, and four or five times the capacity has been taken up by old men, veterans in that work, and next month you will find a large number of mature men from all over the Province coming up to get instruction in connection with the work of live stock judging. The same way with poultry. Now, can it be worked out in connection with horticulture? If there is a field there and it can be filled it will not be long before we will have some special courses in horticulture also.

The Secretary moved, seconded by Joseph Tweddle, the following resolution:

"Resolved, this Association ask the Minister of Agriculture to enter upon the publication of a series of plain, practical bulletins on the first principles of fruit culture."

Prof. Van Deman: I might offer a suggestion that perhaps would be of a little help. We have in the United States Department of Agriculture a series of bulletins that are called "Farmers' Bulletins." We had a long discussion once in the Department Club—a club composed of the officials of the Department of Agriculture—

when we were first starting those bulletins, and we finally came down to that one word "Farmers' Bulletins," and I think it is about the best thing we could have devised. There are some who are afraid of this word "scientific." Now, there is no person in the world that is more useful to the country than the scientific man, and then he must be a truly scientific man, not a scientific fool like some people are—(laughter)—a good, ordinary, scientific man, and then he will be of good account; but the ordinary farmer, this man that you are trying to reach, and can hardly reach at all—is awfully wary of that word "scientific." I think I would eliminate that word. word.

Rev. Father Burke (Alberton, P.E.I.) : We have had a great deal of trouble in bringing instruction to the farmers of Prince Edward Island. We had a number of trees and were not able to find out what fruit they bore, and those trees were said to have come down from Ontario from your nurserymen, who used us as a dumping ground. (Laughter.) So we thought it would be well for persons to go round and do missionary work as spoken of now. We have sometimes meetings where professors from Ottawa come down and do a great deal of good, but it is very hard to arouse public opinion, and sometimes we have to go beyond conciliatory measures and almost coerce the farmers to attend these meetings. I think if some inspectors who understood their duty would go about, and go even into the individual farmers' orchards, and show them what ought to be done, a great advance movement would be made than in almost any other way possible. I know some people who are very intelligent in other things, but are too much occupied in something else to bother about their orchard. They have some very good trees, and if these were attended to they might be able to get profits. They get bulletins and read them over without any practical result. They probably might listen to speeches in some way, but a man going into the orchard and pruning the trees for him and telling him what kind of trees he has and the results he could get would do grand work. In my own parish I have been obliged to take my coat off and put my overalls on for a day and cut whole cart-loads of limbs off trees and fix up an orchard, and then next year we we had that man without any trouble. Up here in Ontario I do not think you are troubled very much about resources, and you have the Federal Government behind you sometimes, and if you could carry out this personal inspection and then give the fruit-growers the bulletins and speeches and everything else you could get some result, and upon the superstructure you make that man such a man that he would be of use to the country. (Applause.)

C. C. James : In that connection allow me to say that we have in this Province about 7,000,000 or 8,000,000 bearing apple trees, and the same number of trees that are just about to come into bearing. I merely mention that to indicate the enormous extent of the industry, and to say that there are some very grave difficulties in the way of treating the work in that practical manner that Father Burke has referred to.

J. McKinnon (Grimsby) : I think we should consider very seriously the suggestion made by my friend Mr. Smith. The Deputy Minister has stated that the demand for good men to go to the farmers' institutes exceeds the supply. Now, the general economic rule is that when the demand exceeds the supply, then the price of the supply goes up, in order that it may meet the demand. (Hear, hear.) I have known of capable men who have been asked by the Government to go out to these farmers' institutes and who have not found themselves able to do so because they could make for more attending to their own business. I think there is a difficulty among us farmers that we do not appreciate our own importance sufficiently ; we have not a high enough idea of our own value. (Hear, hear.) I have spoken to the Minister of Agriculture myself on this subject, and he has stated that the difficulty is to get the members of the Legislature to understand that when a farm labourer can be had for a dollar a day a master farmer of sufficient prominence to instruct his fellow-farmers is worth more than $2 or $3 a day. They are very apt to say, "Why, he can get someone to do his work on his farm for a dollar a day, and he is clearing

a dollar a day by getting two dollars," forgetting altogether that a farmer has a little work to do with his brain as well as with his hands, and that you cannot get a hired man at $1 a day to manage the business of a farm as well as to do its work. There are farmers in the Legislature who are most anxious to keep down the expenses of the farmers' institute and every else pertaining to farmers throughout the Province; and I think the farmers ought to impress upon their brother farmers who are in the Legislature the importance of this work, the necessity of getting the very best men to do this work, and impress upon them the proper sense of the dignity of their calling, so that it may not be said that when a lawyer is fit to do the Government work in the Assizes he is worth from $20 to $100 a day, but a farmer who is fit to do the work for the Government all through the country, and to talk to the best farmers at the institutes, is only worth from $2 to $3 a day. There is one great difficulty in allowing a reasonable fee to the men who go out to the farmers' institutes; as soon as you make the remuneration something to be sought after, something worth having, just then you find all sorts of political pulls to get men who are incompetent appointed to these positions simply that they may get the money. (Hear, hear.) It is apt to be looked upon as a political perquisite, and the work is given, not to the man who can be the most use to his country and to his fellow-farmers, but to the man who has been the most use, or is expected to be the most use, to his political party. Now, I would rather see the fee to lecturers at farmers' institutes kept down to the beggarly $2 or $3 a day that it is now, than to have political heelers sent all around the country to bleed the country of its money for the sake of their health in the next election. But I think that our present Minister of Agriculture has been able so far to act impartially, and to appoint good men on both sides of politics; and if he is able to keep that up—if we can keep our Department of Agriculture and our Department of Education, those two great institutions in which all the people are concerned—out of politics, and if we can get the very best men appointed, then I would say that we can afford to increase our fees to these men to something near the amount that they are really worth to the country and to themselves at home. I hope Prof. James will impress this upon the Minister of Agriculture.

Prof. Robertson: May I offer one observation? In the course of the discussion we have noticed that the various Provinces represented here are all seeking for the best sort of help at farmers' institutes. Now, I merely give this little bit of information to the Convention, that Mr. Hodson, who was formerly so successful as Superintendent of Farmers' Institutes in Ontario, now of our Department at Ottawa, has arranged, in co-operation with Mr. Creelman, his successor in this Province, and with the men who occupy similar places in other Provinces, to have an exchange of the best speakers between the Provinces, for the main purpose of giving these men better qualification and more ability to carry on their work well. One instance will suffice. I think not less than six of the most experienced and capable speakers at the institutes of Ontario are going this year to Nova Scotia, New Brunswick, Prince Edward Island, Manitoba and the Northwest Territories, and then our Department is also able to bring men from these Provinces to be in contact with the experienced men of Ontario, and thereby gain them a wider outlook and more extensive knowledge, and therefore carry back help to serve their Province better when they go back. That is a form of knowledge in which our Department is most happy to co-operate with the Provincial Governments, and from that class of work I look for great benefit, because sometimes a man will listen, not only with interest, but with willingness to be taught, which leads to better action, to a man from a distance more than to one from his own locality. It is not possible quickly to furnish a supply of capable speakers, even if you offer them any amout of money, because men who are capable instructors do not acquire experience in a week; it takes years to gather that, and then it takes months of training to make a man quite competent to give his own experience in such a way that every man can profit by it. (Applause.)

Prof. Van Deman: You know we have a little politics on our side of the line, and I think we have a good deal more to the square inch than you, but I do not see any trouble whatever in the United States with regard to politics in the farmers' in-

stitute. I have not in my mind a single case in which party politics has been any considerable factor in this matter, and I do not think that you have cause to be apprehensive on that score. As to the prices that farmers' institute workers receive, I think that $5 ought to be the minimum, and if I were an institute worker in Canada I should utterly refuse to go for anything less than $5, and I think any self-respecting farmers' institute worker should just come to that decision to absolutely refuse to talk for less than $5 a day and expenses. (Hear, hear.) Some men who are really first-class institute workers are cheap at $10 a day. Perhaps your politics here would not permit you to pay those prices, but you certainly ought to elevate the standard in that respect. The thing will work out all right in the end if you only get your ideas elevated. Why, there is not a business in the world that requires such good sense, such scientific information, such business ability, as farming. (Hear, hear.) Most anybody who has got a few dollars and a little bit of common sense—you don't have to have very much of that—can run a grocery or some little business of that sort; but when you come to deal with the great problem of the tillage of the soil, and the diseases of animals, and the breeding and the insect pests, and all that sort of thing, and the varieties to cultivate and under the different climatic conditions and all that, why, banking isn't anywhere beside it. I want to make this assertion here, that as a class the farmers—and I will include myself, down to the humblest man that tills the soil—there is not any set of business men that know as little about their business as we do, and the farming community needs education above all classes of industrial workers. It was just a few years ago that there was hardly any advanced farmer that knew what potash, phosphoric acid and nitrogen were—the three cornerstones of agriculture and horticulture—for horticulture is just a higher degree of agriculture—but it is not so now. Nearly every intelligent farmer knows what these things really mean, and we are getting education faster than we really think, and what we want to do is to get it faster and faster; and if the farmer is educated the whole body politic will be elevated along with him, for he is the basis of the whole country, the Government and everything else. Therefore, I think we ought to give the most earnest consideration to this fundamental thing, the instruction of a farmer in his business, and as he is the one who pays the taxes I think he certainly ought to have a first-class education. (Hear, hear, and applause.)

The resolution was put and carried.

FRUIT SHIPMENTS TO BRITAIN.

By J. W. Robertson, Commissioner of Agriculture, Ottawa.

I am to speak to you this morning on some provisions that have been made for the safe transportation of fruit from Canada to the markets of the United Kingdom. I would like to make some observations on what has been done so far, what results have been found there, what has been done, in order that we might see where we are at, both what further should be done and what further can be done in the near future, because sometimes things we think should be done are not commercially or economically practical at a certain stage of a business's development. Now, the United Kingdom, as I said last night, imports yearly large quantities of raw apples and raw pears; at least, the imports of other fruits that we can supply are quite inappreciable in volume or in value. The average imports of apples come to above six millions of dollars annually, of which we supply nearly one-third, the United States nearly one-third, and other countries the rest among them. Those other countries are Belgium, France, Portugal and Holland in the order named. Of pears, the United Kingdom imports about $1,300,000 worth, and of those France, on the average, supplies one-half. The supplies from Belgium fluctuate from 40 per cent. down to 10 per cent., according to the condition of the crop, and then the United States supplies

on the average 10 per cent. So far the Channel Islands, which are spoken of often as being a large source of supply, because much in evidence, supply only 2 per cent. of the total imports of pears; and we in Canada supply very little yet—from nothing in 1897, when our first cold storage experiment with pears was made, until we are now supplying something over $50,000 worth a year. So that that is at least a growing trade, not yet very large, but promises to be a great deal larger as time goes on. In considering first how to reach that market, one has to think of a great many things; not merely the conveniences for safe transportation—which includes the package, because that is the object of a package—but also the packing and the condition in which the fruit is packed; because no sort of provision for safe carriage will carry fruit safely that does not start in that condition that makes it possible to carry it safely You can understand that if a pear is quite ripe when it leaves the growers, it cannot land even in Montreal in a fit condition for market, because the retailer wants something with safety in his hands else he will not buy it. I have a good deal of information that I might offer, but I will not do it now, on what our three inspectors under the Fruit Marks Act have found in Montreal this year regarding the condition of apples at the port of Montreal. This I may say, because I believe the Fruit Marks Act is to be discussed by itself, that in not a few cases they have found lots of apples going forward in such a state at Montreal, before going on the ship at all, that they have reported that those apples then were in such a state they would not fetch the freight under any possible conditions of transportation, when they got to the other side—apples that were over ripe and even partially decayed in the barrels when leaving the port of Montreal. So that you see it is not always certain that the best sort of provision on a railway car or a ship will secure safe delivery of all fruit. All that can be demanded is that it shall secure safe delivery of fruit that is put up in such a condition as to give it a fair chance. I think that is all that commerce or the fruit growers will want. Transportation, then, involves transportation from the tree to the teeth of the eater. Of course, we cannot go all the way in what I am going to say this morning. Understand, transportation begins from the tree, and involves risks of apples lying about in the orchard in the sun, risks of them lying in the barrel, and risks of them being damaged in the warehouse before they get to the eater ; so that in dealing with this very well and correctly called perishable fruit product one must expect at least a certain percentage of loss between those two points even with the best system of transportation that can be devised. We cannot look for safe delivery of everything, and I would like the fruit growers to think that out for themselves—that with a perishable product it is quite beyond the probability or possibility in commerce to look for the safe delivery of everything. It is quite possible to deliver objects in splendid condition in the middle of Europe from Canada, and we have done it. We have sent peaches to the Paris Exposition and had them delivered there in superb condition, and there was no cold storage from the port in England to Paris. Still, that is not commerce; that was to advertise the country's climate and our resources. It was not commercially practicable to do that and sell peaches in Paris under those circumstances. You see, the possibility of doing a thing for a purpose is not always applicable to the commerce that must stand only so much expense, because the goods are only worth so much at the end. The need of care is unceasing from first to last. If anyone slacks up care in any part of the journey, then you have some defect. Human nature is a bit weak. People say that everybory is as lazy as he dares to be, including even railway men who look after cars, and stevedores who load ships, and engineers who run cold storage plants, and recipients on the other side ; but in our experience these men have not failed in the commercial part of our work. Then they need knowledge, ability, skill, honesty. The Department of Agriculture at Ottawa is not a Providence to provide these things, and I think you would not expect them to. I would like to repeat that—care, knowledge, ability, skill, honesty; there is no safety in transportation if any of these things are left out. The Department may provide conveniences and the provision, but the people must exercise those. I think that is a clear division and distribution of responsibility. I want to show you

that the Department has provided its part of the work and its part of the scheme most admirably, and then if anybody else has failed in his respects, I am not the judge between the two to say, "Thou art the man"; let the man himself take it to himself. So the relation of the Department to these fruits and its qualities for management is that there has to be provision made, and then the people have to use it. In regard to the provision made, first, for the carriage of ordinary fruits such as apples—not the tender early apples, which are of another class—ever since I remember the fruit growers have been agitating for what they call ventilation on the steamships. I think the very first fruit growers' meeting I attended I found ventilation on the steamships to be one of the burning, live questions. Ventilation, to the man who says it, may mean a good deal or may mean a very little. Ventilation usually implies bringing in of fresh air and the letting out of the other air, so-called foul air. Now air does not of its own volition move. It does not obey anybody's dictum except the dictum of the Almighty through His laws, no matter what a man may say. You cannot command light and there is light, but you can always command light if you open the window; it will come in. The Almighty carries out His laws unflinchingly without any variation. We could not have any progress in human knowledge otherwise. Then if you want to have even what is called ventilation in the place where the fruit is carried you must have some sort of circulation, which means merely going around. Now, you may have circulation through a chamber, or you may have circulation within a chamber. The two are not the same. If you want to keep a building cool you will never dream of having a circulation of warm air through the chamber to cool it down. You would not dream of making a circulation of any sort of warm air through a cold place to make it cold, and you would never think of having a circulation of damp air through a place to make it dry. Now, moist air in the summer time is always warm and moist. But do you know that an inspector who went over the cold storage buildings that were put up in some places in Canada from plans furnished by our Department in 1897, found that these builders had listened to the voice of the wise man and thought it was needful to get ventilation and circulation by cutting a shaft so as to bring the outside air in and freshen it up? And so we found some damp buildings and some mouldy buildings among the others; but wherever the plan of the Department was followed the inside has been cool and dry, because we did not let in the warm, moist air, but by the arrangement of the building and the placing of the cooling agent, whatever that was, we effected the circulation inside the chamber itself, but no circulation from the outside into the chamber. The question of cold storage at large for Canada is one that is hardly yet understood. You cannot get a people like us, widely separated, informed in a new movement quickly. I think we have made wonderful progress in Canada to get ordinary men to understand the meaning of a process like that in a new country, which for the common people is hardly five or six years old. So I make that plain, that circulation inside does not mean a circulation from the outside into the inside. Then just because these things were not looked after in the past and in the best way, I may repeat this morning what I said last night about some shipments in 1898, that taking the whole of the account sales for 185 lots of fruit delivered in the usual way through the port of Montreal in ships that did not have any ventilation or forced circulation—even as recent a date as that—that out of 14,416 barrels, comprising those 185 lots, only 5,528 were delivered in a high condition—a little over a third of them—and the rest were, in varying degrees, slack, slightly wet, wet, wet and slack, and the loss in value at the same time varied from 2s. 7d. a barrel down to 9s. 11d. a barrel less than the selling prices of the tight barrels of the same lot on the average, that is, nearly $2.25 less per barrel for the wet and slacks than for the tight that were delivered by the same ships. Now come the inspectors in Montreal, who give it as their testimony, after a year's observation, that a good deal of the slack fruit they saw results from the fruit being packed too tight—(hear, hear)—that the compression of fruit into the barrel and the bruising a part of it, making it too tight in the barrel, is the cause of landing it too slack. That is the

judgment of those three men who have watched barrels and barrels brought through this year. However, there are now plenty of ventilated chambers in the ships to prevent any damage occurring on the ship after the present year, so far as ventilation and circulation are concerned. Now, in dealing with apples first, it is needful that there should be circulation of cold air through the ship where apples are carried. One instance: In 1900, in examining a shipment of apples out of a car from the Province of Ontario, when the temperature at the car was somewhere about 50 degrees, the temperature inside the barrels of apples as they were delivered at the car in going on the ship, was 85, actual test. Now, you say, they were loaded in a cool time. Yes, but if you load apples at 85 degrees in a cool time and batten the hold down, then you have the apples warm and causing an increase of heat by their own ripening and partial decaying. Such apples were delivered in Glasgow in that case, with this report from our men: "Apples evidently picked too ripe and shipped in far too ripe a condition." I don't say they were picked too ripe, though. They were put in the ship too warm, and there was no way of cooling them, so there was a serious loss. Last year out of 204 sailings of ships reported on by our inspectors—and we have three men in Montreal who do nothing else than watch the loading of every steamship that leaves the port and report to our Department every week how the stuff is loaded, how it is handled, what the place that it is put in is like, and what provision is made for ventilation and circulation—out of those 204 sailings this year there were 96 that had efficient cold storage with no circulation from the outside but a circulation within the chamber itself, and the cooling of the chamber by means of independent pipes all round the sides and on the ceiling, because that is found to be the very best plan for butter and cheese of the grade which this product is put into cold storage. Then there were 77 sailings that had forced circulation by means of fans, that is, the electric or steam exhaust fan would suck the air out, and a provision for letting the cool air outside be sucked into the holds. Now, by having self-registering thermometers—we had many of those on the ships last year, not so many as we would like to have, for these thermographs have to be specially made in Paris, but we have now an extra supply—in some cases you would find where the forced circulation of air from the outside was carried on, a temperature fluctuating anywhere from 45 up to 70 degrees on different days, according to the temperature of the air above. If the warm air was sucked through it warmed up the place where the thermograph was; but in the places where we had a new product made in the ships—which consists of two parts, a refrigerating machine that cools brine inside the pipes in the chamber, and where air is sucked through that chamber, first is cooled and dried, then that air is taken through the holds where the cheese and apples are, and is sent around again and taken then into this cooling chamber, you get the circulation of air from where the apples and cheese are to a chamber that cools and dries it, not to the outside—there we got a temperature that varied so that the highest on one voyage was 48 degrees, and the lowest 39 degrees, the average being 43 degrees. That gave delivery of cheese and apples in very much better condition than we have ever got hitherto. We had that arranged for five steamers last year. It was a new thing. I tell you this, not in confidence or in public—it doesn't make any difference—that with all the writing and negotiation we could not get a single steamship line to consider the thing favourably. They said, "No, that is a new thing that will not succeed, and if you want the thing done you will have to pay the whole of the expense and then guarantee the steamship company against any loss for the space it occupies." That was the steamship owner's attitude. Well, when Mr. Fisher and myself were in England this last summer we had interviews with these steamship owners, and then by showing them the wonderful progress that Canada was making in this improved transportation, by showing them how their own ships were carrying more of this food stuff, we got two or three of them to put it on their ships, and so we were able to arrange for five ships last year, and we will have no trouble this year in arranging for 17 or 22 ships (hear, hear)—because the shipowners said, "If we deliver the stuff in good condition it will stand higher freight rates, because the freight rate

is a mere bagatelle in delivering the stuff in good condition." (Hear, hear.) That system of circulating the cool air in the ships was not exactly a new invention, it was merely a new application of what has been known to some of the best cold storage engineers for some years. And let me put in parentheses here that in our cold storage policy and systems we have not been jumping at conclusions with our eyes shut, making experiments with ignorant men with the public money, but we have invariably consulted the most eminent cold storage engineers on this continent and in Europe before making any experiment at all; and so, while the cold storage system in Canada is known to be a good one, it is not the produce of any one man's planning or conception, but the best cold storage engineers have been laid under tribute. Thy have come to us freely. I don't think we have paid them any fees; but I have gone to these men and said, "We think this is a good thing, what do you think of it?" We have consulted Mr. Bowman, who was trained in Germany and was recognized before he came to Canada as being the best engineer of the biggest cold storage concern in England, that is the London Engineering Company. Then I consulted the engineer of the British Cold Storage Company in Liverpool. I consulted the biggest importers in England, and went all through their places, and got from those men the most civil and courteous treatment on presenting my card as Commissioner from Canada, and had the advantage of consulting their books. Then I had the happiness of consulting J. E. Hall, who put the cold storage on all the Admiralty steamships and 150 steamships of other countries. So we have not gone into this thing blindly; we have not gone into it groping in the dark or believing that every nonsensical thing said about it could be possible or practicable, but we have gone into it in a businesslike way before spending any public money. That being so, I would like to speak a little about the cold storage itself for the tenderer fruit. I have said what we have been able to do for apples, and what we hope to do hereafter for apples in a still more effective way, that is by both fans for circulating the ordinary air and by cold storage, cooling the air and circulating that cool, drier air. Now in cold storage, either land or sea, for safe holding in a building or for safe carriage in a railway car, you need to get one condition implying two things. The first of these is a condition that implies a reasonably low temperature, and then a reasonably dry atmosphere; and when you have these two things you have everything that is ever possible or desirable to get in cold storage. There is nothing more desirable, as far as I know, nothing more practicable by any system of cold storage that I have seen anywhere on the surface of the earth. Now, in getting these two things there are certain principles of construction, and then certain principles of operation which have to be observed. These are as well known as are the natural laws regarding anything else. There are the means whereby you can insulate, that is, prevent the so-called condition of hot or cold air going through. There have been most exhaustive experiments in regard to the insulating ability of every sort of substance, from still air all through the range to metals which are called good conductors. For instance, suppose you take a piece of wood as long as that (pencil shown), you know that you can have that piece of wood burned down till quite near your finger without burning your finger. Wood is not a good conductor; but if you get a piece of iron as long as that and make one end hot you will begin to feel that iron is a good conductor. There are things that conduct heat easily and things that don't conduct heat well. Of all the non-conducting substances that are known the ordinary atmosphere is the best of all if you can hold it still. As it gets warm it rises, and as it becomes cold it begins to fall, and you get a circulation at once. You know the boys' spiral toy. When it is placed before the lamp the upward air runs the spiral, but if you could hold that air perfectly still it doesn't travel. So still air is the best non-conducting substance. That is why the best cold storage engineers come down to this, that if you can get any means of holding the air still, in air you have the best non-conducting substance. It doesn't cost anything. So the object is to get the means to hold the air still. At first it was thought sawdust was a good thing because sawdust would hold the air within its particles. Then mineral wool, cotton batting, anything that held the air still and

was a non-conductor. Then as far as using paper between the boards, so that the paper would not get torn, and then by closing the top and bottom, you can hold the air in a wall still. But we found that paper and boards used will do that. The whole object is to keep the air still, because the heat will not traverse through the air if the air is held still. If you break that space in four or five places by cross curves, and then break it up into compartments you have it all the more efficient. The only objection to sawdust in some buildings is that if sawdust becomes damp it gets mouldy, and gives rise to bad smells, so that you cannot get the bad influence of that out, whereas wood and paper, properly used, with sand in the bottom to keep the air from getting in or out, give rise to no bad smells, and are usually impervious to ferment. These principles of construction have been published as widely as possible. In my report of 1897 you will find pretty full drawings of all kinds of buildings, and pretty full statements of the principles, and one of the very first principles in regard to the inside of these things is that you have the insulation thorough; there should be circulation of air within the chamber, and never any admission of air from the outside. Now a little wrinkle to know about for cold storage of creameries will give you some idea of that. I saw in an English warehouse that where they had a door that was open quite often they had a very tight-fitting canvas cover nailed at the bottom with nails, and the man brushed by and the curtain took in the shape of his body and closed in behind him, and the warm air did not rush in and the cold air did not rush out. We have got those curtains on nearly all the buildings in Canada ; the only difference is that we have split it in two, and the man can get in, and after we made that improvement I gave it back to the same people that gave it to me in the first place, and they said, "That is an improvement ; we won't charge you anything for using it, because you have given us such an improvement." These methods and principles are now in use in over 600 buildings in Canada with success, and giving satisfaction. Someone in the audience last night, when I said 450, said that is not true. Now, that man, whoever he is, has no means of knowing whether my statement was true or not, because he has not inspected these, and I happen to have the reports of our Inspectors who have examined them, and I happen to have knowledge of the products carried in them, and I happen to have examined probably 100 of them myself, and I say to you that what I say is true to the very letter—that there are 600 of those buildings in successful operation in Canada to-day, and other countries have copied our methods and systems of cooling products for shipment to other countries. To come down to the question of cold storage for tender fruits, as provided by this Department for a specific purpose, there was a cold storage building put up in Grimsby in 1897. It was to be put up from plans I furnished, but it was not constructed according to the plans. I had the floor torn up in my own presence, and it was not insulated. I had boards torn off the sides near the ceiling, and it was not insulated. There was no paper in parts, and so cold storage in 1897 was not quite effective. But since these defects were discovered they were remedied in the fall of 1897, before the opening of the spring of 1898, and in 1898 and 1899 that building gave the utmost satisfaction in every single respect for cooling fruit quickly, and there was no bettter building on this continent, or any other to my knowledge, for cooling fruits quickly and keeping them cool. Now, it has been said quite frequently lately that that building at Grimsby was a failure ; that it was not well constructed ; it did not cool the fruit, and was a disgrace to the Department. But that building, after being improved when we learned of our failures in 1897, is the best cold storage building for cooling fruit that I have seen anywhere, and that is the verdict of fruit men who cooled the fruit. I will give you the proof. In 1900 and 1901 that building was under the care of a committee of shippers, not of our Department. In 1899 it was under the care of our Department, and gave the utmost satisfaction in cooling fruit. Other buildings have been put up since on the same pattern. As far as the building is concerned, I will not deal with it again. I will give you the results from the selling price of the fruit and the effect of the building on the fruit when I come to deal with sales. But after the fruit is cooled in a building it must be carried in a cold storage car to be carried safely, because if you take cool fruit out of

a cold building and put it into a car that lets it get warm you just shorten the life of the fruit and increase the risk of it being spoiled. A good many years ago the Department had submitted to it plans of a car called the Hanrahan cold storage car, and those plans showed that the car, if built according to them, would be in very many respects a most admirable and superior car. It had, I think, one or two points that were better than those of any car that I had ever examined, or any plans I had ever seen, and I had no hesitation in saying so to Mr. Hanrahan, who showed the plans and the model to Mr. Fisher and myself. However, shortly after that, when we approached the railway companies to build some cold storage cars of the best sort, I took those plans to Mr. Shaughnessy of the C. P. R., and to the man in a similar position in the Grand Trunk Railway in Montreal, and asked them to build some cars for the use of our Department according to those plans, and I had two interviews with the master car builders in both railways, going into the details of what we wanted so far as safe carriage was concerned, and both railway companies absolutely refused to build one car of that model or of that pattern. Their reasons were these :—"It may be a good car, from what you say, for safe carriage, but it is not a safe car for railway rolling stock from our point of view, because it has four doors, and the load of ice in the middle of the car, instead of over the ends where the wheels are." That was their objection. In the second place they said, "There are patents on it, and it costs us too much money ; we can have good cars without paying this." We have had no connection with that since, because the railways absolutely refused to accede to our earnest request to have these cars built for us for use on this traffic. They refused, and we said, "Well, we cannot force you." They gave us other cars, which in every respect are equally effective ; therefore there is no loss to the country as far as I see. In any cold storage car, however, there is need for constant care, because a car runs, and it moves and sways, and doors will become loose, doors will not fit so well after they are used as when quite new, and any man knows that in shipping grain or cattle or anything else, if the shipper does not exercise care in looking after his car there will be some defect in it. I am shipping now 1,200 cars a month, so I know something about the conditions of shipping. I have occasion sometimes to look after the condition of the cars, and I have many years ago shipped a very large quantity of cheese. That was my business, and so I happen to know the transportation part of it, or the business part reasonably well, and I found it necesssary to block the door of the car to save the product. Every man knows that he must use his common sense, else there will be loss. Now, so far as our Department managed the cold storage building at Grimsby, we had to arrange to keep the doors shut. They put old cars on that business. Sometimes the place where the water runs out is not properly trapped, and therefore the cold air streams all along the track, and cools that instead of cooling the car. We did not do anything except writing the railway company giving the number of the car and where it started from, and the agents all along the line got overhauled for doing that. We sent circulars to the railway agents all along the road in the spring telling them about the doors and the condition of the car. We are making satisfactory progress, though we are not perfect yet. We need constant care. Then the Minister has decided that he will appoint this year a travelling inspector of all cold storage cars, regardless of their arrival at Montreal, so as to keep the station masters still further instructed wherever a cold storage car is, that he will follow that cold storage car and say, "We want a better door; that trap is not closed," and keep an eye on the conductor of it, so that the man will know the meaning of it. I will give you an instance of want of knowledge and the effect of it. Last summer in Glasgow I looked at some butter out of a cold storage ship. The report of our men was that the butter was delivered in excellent condition, and the thermograph, or self-registering thermometer, showed a good record. In thirty-six hours after the steamer was discharged I found Canadian butter lying on the wharf, nearly melted a quarter of an inch in, a part of the consignment. The rest had gone straight to the cold storage warehouse because the men knew their business and looked after it. This other was a lot that was consigned, and I am told the man was hawking the samples around

trying to get a buyer before he took delivery, because then he would have to meet his bills. There were nearly 400 packages of Canadian creamery butter damaged down a quarter of an inch before the man in the retail shop got it, and we heard afterwards that that was Canadian creamery butter. So you may have the best conveniences possible, but you must have a man looking after the thing who is interested in the product. Then to come to the cold storage in the steamships for tender fruits. From 1897 onwards we have been having an increased volume of cold storage with mechanical refrigeration. I mentioned last night the extent of the capacity. It is quite large enough presently for the traffic that demands cold storage service. Take last year for tender fruit. None were carried, as far as our records show, with thermographs in the chambers, except to Glasgow. A good deal went that way, and the thermographs' records show that the highest average on any one voyage was 40 degrees, and between 38 and 40 is the temperature which growers of pears want to have them carried at. A few Canadian shippers like a temperature lower than 34 degrees. The average for the season was 37 degrees. I have the engineers' records, which were taken by myself twice or three times, and had compared with the thermographs' records, and in nearly every case the engineers' log agrees with the self-regulating device, which is locked, and which he cannot get at—which is, in my judgment, a confirmation of the conclusion that in our opinion the engineers have been trying to do their work faithfully on the ship. Now, I would like to take some results from these experiments, and if they have not been quite satisfactory—and sometimes they have not been—I would like to find out why, and where the cause of the failure has been. I want to deal first with tender apples shipped in cold storage. I need not detain you on that. It is enough to say that of the twenty odd shipments at different times made under the care of the Department in cold storage every single one was delivered in capital and faultless condition, with the exception of a few cases in one shipment. The only time that we had an unsatisfactory report on tender apples from our agent in Liverpool was in the case of some tender apples that were sent in the chamber put on the "Manchester Trader," and called the Hanrahan cold storage chamber, and our report that time was as follows:—"Re the shipment of early apples on the 'Manchester Trader,' this shipment had every chance, as far as the space was concerned, as it filled only about one-half of the space of the chamber in which it was carried, there being nothing else in that chamber." A cablegram of September 10th from our agent in Liverpool said: "Trader apples, one hundred half cases, have been sold by public auction here at 1s 6d to 3s 3d; quality, gone soft." That is the only case in our knowledge of tender fruits going in cold storage of which we have any report—over twenty shipments—where the report has been unsatisfactory in regard to quality and condition of apples.

The Secretary: Can you tell us the varieties that were shipped in the successful shipments?

Prof. Robertson: The same as were sent from Grimsby—Astracans and Duchess, and those apples. Then the cablegram was followed by a letter of the same date, September 10th, of which the following is an extract:—"The 100 half cases of apples of Ontario Government consignment created much excitement at sale to-day, but prices were low, as large supplies of Morello grapes, etc., were offered. The apples looked well, but being early varieties had gone soft and melting, and were not good eating."

Mr. Caston: That is, they did not pick them soon enough.

Prof. Robertson: I want to repeat that of the varieties of apples shipped under the care of our Department, including twenty shipments, we had no such report as that, and there were no apples delivered in that condition, as far as our evidence could be obtained.

The Secretary: Have you lists of the varieties of the apples in those twenty shipments?

Prof. Robertson: I have; they were all sent from Grimsby, and I think most of the lists were furnished to us by yourself. Now I want to deal with the shipments of pears, and as I see it is 12 o'clock I promise you I will be through by half-past

twelve. It is needful for the status of our fruit in the English market, and elsewhere. I will say nothing about the shipments of 1897, the first year, because we were feeling our way then, and the building at Grimsby was not satisfactory, and many of the peaches and pears did not land in very good condition that year. But now I come to deal with the shipments of pears in the season of 1898, because I take it that tender apples and pears and other apples are what we want to send to England. I need not recite the details beyond saying this, that a quantity of pears were sent over in those trial shipments that year—only a few, 2,208 cases. They were estimated to hold about 26 or 28 pounds the half case. Now, take the whole lot. I need not give you the details, which have been published quite widely, and the conditions ; but taking the whole shipment, I find that they realized at Grimsby, after all expenses were off, 73.6 cents a case. That was not a bad price considering it was a new trade, and there were promiscuously gathered up lots. I want to make just this one remark, that the difference in the lots of pears on the earlier shipments varied in the first shipment from a dollar a case down to 46 cents a case at Grimsby, transportation being the same. You see it is not all in transportation, because these pears had all the same transportation; at the same time, one lot netted over a dollar a case, and the other netted only 46 cents. Some went as high as $1.12 a case. I need not go into that at great length, but these are the results. Now, in the "Canadian Horticulturist," which, I understand, is published under the auspices of this Association, in June of the following year, when these facts were all quite widely and well known. I find this—an article signed by F. R. Latchford of Ottawa, in which he says regarding the temperatures necessary to be kept on shipboard for safe carriage :—"Such temperatures have been maintained in the shipments that have been recently made to England. The cold was produced by the most approved chemical processes. The temperature of the storage chamber was all that could be desired, but no application was made of the cold produced to rid the chamber of the moisture, gases, odors or heat produced by the goods carried. The result was necessarily a failure." This is an entirely incorrect statement. The result was not a failure, but was safe carriage for the pears, and the provision on the ship provided for the removal of the moisture and the heat—the only two things that can be removed, or should be removed, in carrying pears. Then let us come to the shipments of 1899, and I would like to show what they resulted in. In the shipments that year some packages were smaller, and the receivers in Liverpool reported that they contained from 16 to 18 pounds. Now, those pears again realized from 50 cents a package net at Grimsby to $1.54 at Grimsby. You see the difference was not in the car, nor in the ship, but in the fruit at the original starting point; and, although they were carried in the same car and on the same ship, and sold in the same market, the differences were as wide as that, from 50 cents to $1.54.

A Delegate : How do you explain that ?

Prof. Robertson : In one case the fruit was well packed and not too ripe, and in another case it may have looked reasonably well, but it was altogether too ripe, and landed dozy, going in the same car and the same ship. The point I want to make quite clear is that the safety is in the condition in which the fruit starts, because some fruit was carried safely all the time, and if it started well I think it has always gone well. Then take the reports in full, which have been published for nearly two years, and which I will send for the asking, that those pears that year realized 83 cents a case and a fraction over the whole of the pear shipments net at Grimsby after all the expenses were off, in spite of these low ones ; and we have the most convincing reports from the receivers and the dealers that the pears were landed in capital condition, except the few lots that were over-ripe. Now, that being so, I want to refer to the "Canadian Horticulturist" again, which is the organ of this Association. On page 192 of this issue of May, after this thing is given to the public quite fully and freely, there is an article, evidently an editorial, and it says this :—"Just one thing is lacking, and that granted, the fruit growers of the Province would begin exporting these fruits at their own risk, viz., the guarantee of safe carriage within certain limits of temperature." Then it goes on to say at the very close :—"But the difficulty is to get the tem-

perature guaranteed on shipboard, or, if guaranteed, to be honestly kept." You see, all the while throwing doubt and a little bit of suspicion on the ship's management, when the records are and the evidence is that when the fruit went on the ship well it was delivered well, and the end of the business was that a man, when he put good fruit up, and ready to start in good condition, gave this provision that was made for it at the other end a fair chance. I want to supplement that statement with the proof. Say the shipments of 1899 were all right. The Department did not only guarantee in writing that the temperatures would be kept, but it saw that they were, and has the evidence that they were kept on the ships at the proper temperature. Now I come to the shipments of 1900, and those shipments were not made under the auspices of our Department at Ottawa. The cold storage building at Grimsby was freely turned over to the Committee of Fruit Shippers for themselves to manage. Our Department, however, arranged, as far as practicable, to get space on the ships, with cold storage, to carry the goods safely. Now, after the season's work in December, 1900, there was a long article on successful export shipments of tender fruits in the "Canadian Horticulturist." I want to point out a few statements of this article, so that we will not be going on a false basis or assumption regarding what we need for the fruit trade. After saying how the provision was made, and what provision was made, and who it was made by, it says the first shipment by the "Manchester Trader" was chiefly of Red Astracans and Duchess apples, and was forwarded on the 25th August ,and it goes on to give other details. "They arrived in Manchester in fine condition, which proved how complete a success Hanrahan's system of refrigeration is, for the Astracaan ripens, in ordinary conditions, a few days after it is picked." That is the statement about the only shipment of tender apples of which our reports speak as being landed in an unsatisfactory condition. Then on the next page appears this statement :—"However, we had the satisfaction of knowing our fruit reached the market in the very best condition, and of establishing a reputation for our fruit that will be worth millions to our fruit growers in the immediate future." That is what it says about that shipment, and referring to some others, and then goes on to say the second shipment was made by the steamer "Commerce," leaving Montreal September 15th, just in the nick of time for Bartlett pears, but too early for Crawford peaches, and goes on to speak of the excellent condition in which the shipment ex "Manchester Commerce" was delivered ; and the steamship "Manchester Commerce" was one of the steamships fitted up by our Department the same as it has been for years, and delivered the fruit from these people in splendid condition, and there is not even the insertion of an explanatory paragraph. And now I need not make any further report of that in the meantime. Then, further, there is a report in this also which is an evident intention to report the results of cold storage shipments in tender fruits, that there was a third shipment sent forward on the "Manchester Trader." That was a specially fitted steamer, not fitted by our Department, and this third shipment was sent at a later time when all the conditions were more favorable in cold weather and all the rest of it, for safe carriage ; and the report on the shipment ex "Manchester Trader" published here from the people who received that fruit is this :—"We have now the pleasure to report on the shipment ex 'Manchester Trader' of grapes, pears, apples and peaches. The latter were nearly all spoiled, and we should say that they were packed too ripe, and besides this we see the Wilson cases are not ventilated at all. Kindly examine, and you will see that this is correct. It must have a serious effect upon the fruit." The report from the agent in Liverpool—not our agent—on the grapes carried then says :—"The grapes, speaking generally, were in very good condition. An occasional sample was slightly wet or mouldy, but on the whole they looked attractive and sound." Then further on it gives further reports as to the condition of that shipment, which show that that shipment was not delivered in good condition. That was the shipment in cool weather. It is rather glossed over. The date of sailing from Montreal was October 5th. In the meantime there had gone from the same people on a steamship fitted up by the Department of Agriculture at Ottawa—and had been the same for years—a shipment of pears and other things, and our agent, in a letter dated October 12th, says that :—"Some

of the pears arrived ex 'Manchester Commerce' are in prime condition to-day—twelve days out of cold storage. I have kept them in a warm room, so the conditions have been quite as trying as if they had been in a retail shop." The report from our agent in Liverpool regarding those pears carried in the "Manchester Trader" was as follows:—"Our grapes"—that is, the grapes carried in the "Manchester Trader" not in cold storage—"our grapes were in far better condition than Potter's"—out of the Hanrahan cold storage—"which were carried in the Ontario Government chamber. All I saw were wet. Peaches mostly rotten. Bartlett pears and Flemish Beauty altogether rotted, and the whole consignment was not landed in as good condition as the fruit that came ex 'Manchester Commerce' in the cheapest refrigerating chamber." Now, that being so, rather gives me the impression, as well as the information, that there must be something not quite sound and fair in making the reports as to the results of cold storage shipments. Now, another shipment was made in the Manchester ship City—that was a chamber fitted by our Department, and here again, from our report, the fruit was landed in good condition and sold at good prices. The third shipment by the Trader sailed as late as November 18th, when the weather was certainly cool enough to give every sort of safe transportation. I have not seen the report of the fourth shipment yet, but I am told that the report was so unsatisfactory that the shippers wanted to be refunded by somebody for their loss on it, a thing we have never heard of nor did in any part of our experience in any cold storage shipments when the weather was as cool as it is in the month of November. Now I come to shipments made in this current year, which were not of very much volume, and were made by shippers at Grimsby on their own behalf, and they were carried to Montreal in a car provided by themselves, and put in the cars provided with cold storage, and went into the steamships provided with cold storage. They went on the steamer "Lakonia" on September 12th. I find in the "Canadian Horticulturist" for November an article which is headed in large type, "Ocean Cold Storage Not Yet a Success," with smaller capitals underneath, "Bartletts Either Cooked or Frozen," and then the article goes on to say that some shippers at Grimsby are very much dissatisfied with the returns from the pears shipped on that steamship, the article leaving the impression that the whole failure and all the fault was with the cold storage on the ocean. It says:—"A few of us at Grimsby, anxious that the experiment so well undertaken should be continued, forwarded at our own risk to Glasgow from Montreal on the 12th September, per Donaldson Line, 1,120 cases of Bartlett pears, green and hard, and in a condition which we believed would carry them on deck in the open air in safety. Our surprise was great to have the report from Thos. Russell of Glasgow, the consignee, dated 28th September, to say that the whole shipment landed in bad condition, and over-ripe, and had to be sold at from 2s to 5s a case, and a good many cases were worthless, and that some lots would barely pay the freight. While our shipment was kept at too high a temperature on shipboard while lying at Montreal, and for the first three days out, after which it was at last got down to 40, we notice that the first experimental shipment of Bartletts from the United States Government was injured by too low a temperature, and some of the fruit was frozen." I will give you the facts about that shipment. The proceeds now show that some of that fruit netted 58 cents a case at Grimsby, although it struck a very bad market on account of dullness, and some of the same fruit, in the same car, and in the same shipment, in the same market, netted 1¾ cents at Grimsby. That may mean something. I want to tell you further why I know so much about this fruit, and why I am saying all these things; to get at the trouble as to why there has been a lot of publication that the cold storage on the ocean is not a success—it has damaged the country and made the people of England say, "Why, we will not pay a good price for your pears if your own people and your own journal say that your cold storage on ships is not a success." Now you can quite understand that you can make a shipment of pears in cold storage, and some of it is wretchedly bad—I use the word advisedly—and then the rest would not sell as well. Could a man expect to get 58c net at Grimsby when the other fruit was wretchedly bad? One shipper at Grimsby—I will not give you the name—accidentally opened a case and telegraphed me on September 10th, "Much

fruit shipped last night, Glasgow, under marked size, slackly packed, culls. By all means inspect Montreal on arrival." And so, as my duty called me, I sent three official inspectors to Montreal to examine that fruit before it went on board the ship, and I sent a copy of the report of those inspectors to each shipper, and so the writer of that article was informed about what the inspector said about the fruit that had left Montreal. Other fruit went on the same ship. Before I speak of that I want to state what the inspector said of that fruit. I will give you specimens of just some cases. "One case marked 2¼, 3 in 10 small." That is the inspector's official report to me. I did not see this one. "One of those scabby, being 3 in 10, not as marked. A No. 1, 2½, 2 in 10, slightly under size, 2 in 10 deformed, one of those over-ripe, being 4 in 10 not up to grade as marked." Then a good deal of the fruit was sent 1¾, and small at that. Then some cases were sent to Ottawa for examination next morning, and after examination there by competent men, not interested, one case had 60 specimens then over-ripe, and the reason why they did not bring a big price is blamed on the ocean transportation, and published in the official journal of this Association. I took pains then to find what was happening, and so I found that some other men shipped pears on the same ship. Well, I thought if their pears were also landed badly we must try to correct it somewhere ; but Messrs. Hart & Tuckwell, large shippers in Montreal, who shipped pears quite extensively, finding the business profitable, said :—"At your request we give you the report of the pears we shipped on the Lakonia to Glasgow on September 12th last. The peaches were fairly ripe when shipped. The pears were in good condition. The market was in bad shape owing to heavy receipts in Glasgow of Scotch and English pears. We have no complaints to make over the cold storage facilities of the steamer." Then I wrote to others. John Barrie & Sons said :—"We shipped on September 12th, per S. S. Lakonia, to Glasgow, in cold storage, 300 boxes California peaches"—and more are coming our way, because they have, they say, the best and safest transportation they can get on the ocean"—and 212 cases California plums, which arrived at destination in excellent condition." So you see that article saying that the cold storage was not a success, but was a failure, was an article that had no basis in fact, and was an article that had no business to be put in your journal, in my judgment. Then I want to say one thing more about this particular shipment, to show you that this cold storage in this particular case was just as it has been always. Some of those pears shipped by Hart & Tuckwell were sold in Glasgow, all of them in fact, at an average of 5s 3d a half case, which netted over 90c at Montreal. They were very well satisfied. It was a very capital price. And then, later on, a shipment was sent on another steamer, The Marina, and the same two shippers from Grimsby whose fruit was so disastrously losing to themselves evidently on the first shipment, realized on the second shipment, from the information I have, respectively 27 and 26 cents per case at Grimsby, whereas other shippers there realized a fair price; the first time realized out of the same shipment on the same ship respectively 70 to 77 cents per case, so that it is not the transportation, or it would affect everybody. Then the third shipment, which was again under similar conditions for transportation—I have not got the actual account sales yet—but the whole account sales for one of the large shippers netted 93 cents a case at Grimsby after all expenses were off. Now that is, to my mind, rather complete evidence that, so far as the cold storage on the ship is concerned, the cause of failure and loss has not been there ; and this evident desire to campaign in favor of something against the truth does not stand, and we are not going to have it stand—(hear, hear)—because truth is just, and must prevail. Whatever action you desire to take I do not mind. I only want to make that statement by the authority and instruction of my Department before this convention of this Association, because these statements have been going broadcast in your journal, and the statements are incorrect and misleading, and should not have been published. Now I have nothing further to say on that beyond this : that lest somebody should say I have made a mistake—because you do run risks of making mistakes ; if you do not yourself your men do—I had four cases of that fruit retained by my instructions, under my authority, under the Fruit Marks Act, and I had those cases of fruit frozen

solid then, and those cases, at least two of them, are available for examination by a committee of this Association if they want to examine them to this day. (Hear, hea.r) And lest there might be some misunderstanding again, I had a basket of that fruit taken from those cases sent to Ottawa for inspection sent to the meeting of the Privy Council, then in session, because they were responsible for the money that I was the means of spending. I said there is nothing that makes one believe like seeing, and I sent a large sample of that fruit as it came from those cases over to the Minister of Agriculture in session. Of course I do not know what was inside those doors, but the fruit went in, so I think that some people who have been responsible for this know at least what that fruit was like, that fruit which was the means of saying our ocean cold storage was not a success, so justly and fairly described in the telegram of one of the shippers, in which he said that the fruit was under marked size, was slackly packed, and culls. That is as accurate a description as I could give of the fruit I saw. I want to give you one instance before sitting down. I have not claimed all that has been done by this system of cold storage, because we have sent, as I mentioned in passing, pears and peaches and tender fruits all the way round to Paris in safe condition in this exhibition work; but the whole record of our commercial work is that the fruit has been carried in safe condition, that our Department shipments in 1898 and 1899 were uniformly profitable in pears. Peaches and tomatoes are doubtful always, because they do not keep. This year the cold storage of the same sort was used to carry fruit over to the Glasgow Exhibition, and I am told that one of the men brought back specimens of the fruit from the Glasgow Exhibition, and they are in a fair state of preservation. They may be evidence of some progress. We want to have more yet, and we want to have some improvements now, and we have been making substantial progress and making real improvements in the judgment of competent and able men ; and I think it necessary to say these things to get behind and get below all these things that are not correct, and that are not giving our country and our Association a chance to do its best, and getting at the facts. I will be very glad to take part in the discussion, and to prove down to the hilt everything I have said in this matter.

Mr. Hanrahan : Just one question before Prof. Robertson leaves the floor. As he is going to be a leading authority in handling the fruit products, and as he has condemned the Hanrahan system, will he state what is wrong with the Hanrahan system that gives such results in accordance with such reports as he has already given to the meeting ?

Prof. Robertson : I have not said a syllable in condemnation of what is called the Hanrahan system. I have read the report and the results.

MR. WOOLVERTON'S REPLY.

The Secretary : I shall not take up very much time, as I have not come prepared to enter into a discussion of this kind ; but I would just like to say with regard to the statements that have been made in the "Canadian Horticulturist" that I have been actuated solely by a desire to forward the interest of the fruit growers of Ontario, and if any of these statements are inaccurate they will be corrected where so proven. I do not know that anyone present at the convention has a deeper personal interest than I have, or has more at stake in this matter than I have myself, or is more anxious for this work to go forward to a successful issue than I am. The omission to mention in the "Horticulturist" that the steamer Commerce, on which our second cold storage shipment was made in 1900, was fitted out under Prof. Robertson's instructions, has already been corrected in that journal ; but the statements which we have heard to-day regarding the condition at Liverpool of the Astrachan apples carried by "The Trader," in the cold storage chamber fitted by Mr. Hanrahan, which left Montreal August 25th, 1900, are quite different from the statements concerning those same apples made by Mr. Peter Byrne, the Ontario Government agent at Liverpool, who was present at the unloading ; they are also quite different from the statements of our consignees, who reported that "the fruit could not have been carried better, the new arrangement of the brine pipes being a splendid improvement."

The comparative failure of our last shipment by the Trader, sailing from Montreal November 18th, 1900, is not due to any fault in Hanrahan's construction of the cold storage chamber ; it was due to the fact, which has already been fully explained, that these pears were frozen at Montreal in transferring them from the car to the boat, of which the following statement in a letter from B. W. Potter & Co., the consignees, is in evidence :—"Manchester, 8th December, 1900. Sir,—The Trader has arrived, and we hasten to inform you of the condition of the fruit sent by her. We understand that whilst she was loading there were seventeen degrees of frost, and, from the engineer's report, that it took six days for the chamber to reach 39 deg. Fahr., no brine being pumped in the meantime, we judge that the fruit had been pretty well frozen. The result is that the pears rapidly rotted ; almost immediately they were discharged they went off in color, and we fear it will be difficult to dispose of them at anything like a price."

Regarding the statements in the "Canadian Horticulturist" of 1901, criticizing unfavorably the cold storage of the steamer Lakonia, these will be duly corrected if proven inaccurate, but when two of us who made up a large portion of the consignment lost about $250 each it led to making stronger statements than perhaps are wholly justifiable. Now I want to give you a few words in regard to the shipments this year. There have been forwarded four different trial shipments of pears during the season. The first was by the "Lakonia" of the Donaldson Line, for Glasgow, to which reference has been made this morning, which sailed from Montreal September 13, consisting of 1,120 cases of Bartlett pears. These left Grimsby on the 9th in a refrigerator car, and at that time they were very firm and green. After they arrived in England we had a letter from the consignee saying :—"We regret to inform you that they landed in a bad condition and over-ripe." I have here a summary of the net proceeds, which I will not take up your time to read. They range all the way from 1c a case to 50c a case net proceeds. There is a letter from Thomas Russell, the consignee, to say :—"I do not think I could add anything to my last letter regarding these pears, and you will see for yourself from account sales how they sold. A heavy percentage were in bad condition, and I think they had been too cold in the refrigerator. I have to inform you that your consignment by the S.S. Marina has arrived in better condition, and yesterday we sold the majority of these at 3s a case, and a few up to 5s per case." These reports were very unsatisfactory, and led us to inquire where the blame rested for these goods arriving in bad condition. Letters from the steamship company showing that it was not until three days after leaving port that the temperature was got down to 40 degrees led us to blame the cold storage on shipboard. Prof. Robertson's letters, with the reports of the inspectors, would seem to cast blame on the packers for putting up fruit that was over-ripe. The small size of some of the fruit that was shipped, which have been designated "culls," the shippers explain by their desire to test Bartletts two inches in diameter in the Glasgow market, and the returns show that it was worth trying, for nine cases of the two-inch Bartletts that arrived firm sold in Glasgow for $1.20 per half bushel case ! The chief difficulty, therefore, was with the over-ripe condition on arrival.

Prof. Robertson : May I inquire were any smaller than two-inch sent ?

The Secretary : There were a few sent less than two-inch. I think we could perhaps get at the sales of those also. I claim that it was a proper experiment for a shipper who was largely interested in Bartlett pears to try what the result would be to ship a Bartlett that was presentable that was of a small size, so long as the package was of that character and sold for that size, because, in his opinion, it might be that they would bring a satisfactory return, and we want to find that out as an experiment. No doubt the work of the inspectors in Montreal was as thorough as could be in the little time allowed them, which was a few hours while the load was being transferred from car to boat. It is to be supposed that they chose such packages as seemed slack for examination. There was one lot of cases which were made of lumber too thin to hold the fruit properly without the middle partition. But these formed a small part of the whole consignment. In order to arrive at the truth of the matter as to where the

fault lay we have secured the testimony of the shippers—some of whom are here to speak for themselves—some of the packers, and the men who superintended the cold storage at Grimsby. This is from one of the packers of my own part of the consignment—there are other gentlemen present who can speak for their shipments :—

"This certifies that I packed the Bartlett pears for L. Woolverton that were shipped from Grimsby on the 9th September for the S.S. Lakonia, and that they were very green and firm when they left the packing house. As to size, I did not use the grader, but had a sizer on the table, and tested every specimen that looked doubtful. (Signed) A. Plain."

Of course this is as much as most people would be prepared to do in making up shipments unless they had a grader, which costs anywhere from $10 to $30 or $40—to have a cardboard with holes in it before them by which they could test any specimen that looked doubtful. Then another certificate from the manager of my fruit farm :—"This certifies that I gathered the Bartlett pears for Mr. L. Woolverton for packing for S.S. Lakonia, and that they were, in my opinion, almost too green and hard, being scarcely full grown ; that I nailed up the packages when filled, and that they for the most part were tightly packed, except one lot of cases which were made of very thin lumber, sawed three to the inch. Those sawed two to the inch were all right, and held the fruit firm. I also superintended the cold storage at Grimsby for this lot of fruit, and had it kept as near to 40 degrees as I could with ice until the Monday that we loaded the car, when, owing to the large quantity stored, including 500 cases from one shipper, the temperature rose to about 50 degrees. I also saw some of the packages opened that day, and they were still green and hard. I also examined the ice boxes on the two cars into which we loaded them, and they were well supplied with ice. They were ordinary G. T. R. refrigerators. P. Blanchard, Foreman." I have here the list of the shippers who shipped in that car, who are most of them present, and will probably give you their testimony in regard to the condition of these pears when they left their packing houses.

This is from one of the shippers who is not present :—"This certifies that I personally superintended the packing of my Bartlett pears for the steamer Lakonia of September 12th ; that they left Grimsby in a condition as green and hard as it is possible to ship them and expect them to ripen; that the sizes were 2¼ and 2½ inches in diameter, and that my net returns for the 47 cases was only 62 cents, or about 1½ cents a case, and that I am quite discouraged over the whole business. E. J. Woolverton."

This is from another shipper, who is present :—"This certifies that the Bartlett pears which I packed and shipped by the steamer Lakonia left Grimsby in a perfectly green and hard condition. A. H. Pettit."

In order to trace the matter a little farther, we wrote to the Robert Redford Company concerning particulars of temperature at sea, and received this reply :—"October 18. We have yours of the 8th. and have gone carefully into the temperature of the steamer Lakonia, and find that after the fruit was loaded the temperature gradually declined until the third day out, when it reached 40 degrees"—what was I to infer ?—"It did not not rise above that figure until the pears were finally discharged at Glasgow." Surely here is a weak point in the link if they are three days after leaving port before the temperature can be brought down to 40 degrees.

The inspectors speak of finding many small pears in this lot ; too small to give us profitable returns. Now, so far as these account for our small net proceeds, we quite understand the circumstances, and are prepared for the results—indeed we purposely tried small ones so as to see what the results would be. Our net returns from the Marina, sailing from Montreal September 20th, were mostly satisfactory. I have a list of those here. The third shipment consisted of Duchess, Anjou, Clairgeau and other hardy varieties, and left on the Kastalia October 3rd ; the return was a net average of nearly $1 per case. The carload of Keiffers sent forward by one of our shippers who is here present, was made up entirely of his own fruit, Mr. Murray Pettit of Winona.

This variety is a good shipper, and will stand much more abuse than the Bartlett. This shipment arrived in Glasgow in excellent condition, and Mr. Pettit can tell us whether the returns were satisfactory. This is all I have to say on the subject. I only hope that Prof. Robertson and everybody present will at least give me credit for trying to do the right thing in the interest of fruit growers, and not accuse me of having any hidden purpose in view in any statements I have made. I think anyone who feels very much disappointed and hurt over certain results feels like saying, maybe, more than he would say if he did not feel just that way. I thank you for the time occupied. (Applause.)

Prof. Robertson : May I supplement what Mr. Woolverton has said to some extent ? I merely want to give any information I have that will help to a clear understanding of this. There are three shipments, one of the Lakonia, and on the Marina, and on the Kastalia. There is no question but that a part of the fruit on the first shipment landed in first-rate condition of fitness ; the evidence is that a part of it was in a first-rate condition when it started. All of the next shipment was evidently put in in good condition, and arrived in good condition, so that the cold storage system on the three shipments is exactly alike. The engineer's report of the temperature is the same within one degree.

The Secretary : But the second shipment was three days out before it was reduced to 40 degrees. Now, there should be one day in port while these goods were being loaded (hot weather), and if the temperature was up to the temperature outside it might be 70 degrees or 80 degrees. There would be four days in which Bartlett pears would be exposed to a high temperature. Surely this would be enough to ripen them unduly and cause the loss.

A. H. Pettit : I would like to ask Mr. Robertson a question in regard to the cold storage on board the steamship. Is there a possibility that the boxes of fruit on the outside of the compartment, near the pipes, might be frozen, while those in the centre part of the compartment near the thermographs might have possibly the exact temperature required ? Is there a possibility of one gentleman's fruit going through all right and another's all wrong in the same compartment in the same steamship ?

Prof. Robertson : I do not think so, for this reason : If the fruit were stacked in a solid block, then the air coming in contact with the brine pipes and coming out cold might be, so as to chill or freeze those close up, and leave the whole of the heart still warm; but all the fruit was stored with quite a space between the rows, so as to permit of circulation, and our agents—who did not know anything about this at all, and who made me a report in the usual form when the ship landed in Glasgow— say that from the appearance of the package and the appearance of the chamber the fruit was in excellent condition. This is Mr. Oak's report back from Glasgow on the official form. I will say this, also, that it is not usual, and hardly safe, to bring down tender fruit from, say 50 degrees or 55 degrees to 40 degrees, all at once. The safety and the benefit comes in bringing it down gradually. Now the steamship record shows that the fruit was at 54 degrees when the chamber was closed, which was not a very high temperature; that next day it was 44 degrees, the next day it was 42 degrees, and the next day 40 degrees. Now, anyone who understands cold storage will see the desirability of bringing it gradually down that way, rather than jumping it all at once from 54 degrees down to 38 degrees, and after it was kept at 38 degrees, 39 degrees, 39 degrees, and was at 39 degrees when the chamber was opened for discharge ; and other records are like that. I think so far as the ship is concerned that there was no damage and no injury there ; still I will get all the information I can on those points.

E. D. Smith : Would you state a little about the method of cold storage on those ships ? Are the pipes all round the chamber, as we have been told, and overhead ?

Prof. Robertson : Yes. I am not sure whether there are pipes overhead in this particular ship—that is, I do not recall this particular ship myself. I will tell you how these chambers are cooled, especially the ones where fruit is carried. There are brine pipes around at least three sides of the chamber. Suppose this is the ship (illustrating), very often you have a hatchway in the middle like that. Well, there may be a division

across there and there ; that is the shape of the cold storage chamber, that "L" thing. In that case the pipes are around these two long sides, no pipes around here ; then in front of the pipes there is a little space and one lining of lumber that comes within six inches of the top, so that the warm air will go in there and be cooled and dried by the pipes and go down here again. The fruit is packed in such a way that between the rows there are 4-inch bars, which provide room for circulation all through the fruits. In some ships they have the cold storage pipes on the ceiling also, because the butter men and meat men want it that way. Wherever it is possible we have cut off the ceiling pipes, but in any case there is no chance of the ceiling pipes freezing fruit, because that is the warm part of the chamber, if there is any warm part at all. The reason we cut off the ceiling pipes is this : that sometimes when the chamber is open, when the fruit is being loaded, the water will condense on those pipes and drop off and wet the top layers, and that is the reason we have sometimes covered them.

E. D. Smith: Do you think you can get a good circulation of air through the chamber with the pipes on three sides of it as you could, with the pipes on one side only ?

Prof. Robertson : Quite, if you face your pipes in such a way as to get your opening near the bottom. With that, even if you got the pipes on all four sides, I think you could get a better circulation still. You get it from the centre both ways, and the big chambers they have for the carrying of meat from New York have the pipes on four sides, and the ceiling as well, where they carry the meats at a uniform temperature of 29 degrees.

A. M. Smith : Do you get the circulation there with the pipes on the ceiling ?

Prof. Robertson : Not so well, but in carrying meats the circulation would be so sluggish that they put more pipes on top and let the cold air fall right down, and that helps to make the circulation in the centre.

Prof. Van Deman : In the United States this matter of cold storage is being thoroughly investigated by our Government authorities, and I happened to be down at the Washington cold storage about two weeks ago, and in conversation with the Superintendent there I learned something connected with the experiments being made now by the Department of Agriculture that is quite new to me, and this is the point that I wish to offer here. This Superintendent informed me that they were making careful experiments to determine how long it took packages of fruit to change from the temperature in which they were put into the compartments to the temperature of air in these compartments, and he said that the self-registering thermometers in the centre of an apple barrel had shown conclusively that it sometimes took as long as a week for a barrel of apples to cool through to the centre. If that is the case it might cut quite a figure in some of those experiments that you are perhaps wondering about. It is no wonder that some fruits might perhaps ripen up faster than we think they would.

The President : Do you know what the temperature was in the compartment ?

Prof. Van Deman : I don't know, but they have varying temperatures down as low as 30 degrees.

Mr. Caston : That is assuming that the barrel is closed tight ?

Prof. Van Deman : Yes.

Prof. Robertson : In the case of those shipments, however, the packages were quite small and quite open, so that there was a good chance for them to be cooled quite quickly. First as to the quality of the air in which pears and things of that sort may be kept. There are things that decay from the surface, and therefore the quality of air has some influence on their decay ; as you all know, pears that are spoilt, spoil from the core, where the air that surrounds them never comes at all, so there is a question of getting a low enough temperature to stop the natural ripening of the fruit. Now, at just what point that is stopped in some varieties of fruit, I think nobody yet knows. I rose to say this—which throws some light, in my own mind, on many of our difficulties—we have all believed, in fact we have known, that, say, the curing of cheese and the ripening of fruit were a good deal alike, by caseins that are inherent in the substance, apart from the rennet at all. Now it has been proved that the casein of milk, which is

an unorganized ferment, will carry on the curing of cheese away beyond the point at which any of us thought it would act, because it has been held generally that if you get cheese down below 36 degrees it stays quite unchanged ; but this year I saw cheese that was put down to 18 degrees the day after it was made, and frozen solid and kept for several months, and was cured at that temperature, the casein acting slowly, but acting to cure the cheese at a temperature of 18 degrees. That makes it more evident that we are only at the beginning of knowing how to keep fruit, especially tender pears, and if they got a little too ripe at all the temperature of 36 degrees would not stop it, whereas if you get the fruit a little less ripe, where that ripening agent is not active, then you can keep your fruit. I have kept pears for three months myself. It is a question of getting at the degree of ripeness, which none of us has the evidence of. At any rate I am quite sure that as far as the temperature of the ship is concerned 36 to 42 will carry the pears quite safely. It has done that, and a few degrees more or less does not make very much difference, but a great deal depends on the state of ripeness of the fruit; and our fruit inspectors will tell you that a great deal of that fruit at Montreal was fit to eat then, and actually was rotten in Montreal. I will call these men to the stand if you want them. And at Ottawa I had rotten pears, not merely ripe, but rotten, and I ate three of them that were quite as juicy and ripe as they could possibly be.

The Secretary : We could not possibly pick them greener.

Prof. Robertson : I am sorry it is impossible to pick them greener.

D. J. McKinnon : It is necessary not only that the fruit should be carried at the proper temperature on the steamer, and that it should be picked at the proper ripeness, but that it should remain at the proper temperature between the picking and going on board the steamer. Now, I happen to know something about this shipment in question from Grimsby. I know that the temperature in the cold storage warehouse was sometimes over 50 degrees, and up, I think, to 55 degrees before the pears were put on board the car. I know that for some reason or other the cold storage warehouse was not at all in good condition for storing the fruit. I need not go into the reasons why that was so, but it was so, and I think all of us from Grimsby know that it was so. I think it is quite possible, and I believe it is true—the gentlemen who have made these statements are above suspicion—that these pears were picked in good condition, and that they were spoiled between the unloading from the farmers' waggons at the storehouse and their arrival in Montreal. Now, again at Montreal, they were put on board the boat at a temperature of 54 degrees. If they had left Grimsby in good order they should not have been at a higher temperature than 40 degrees. If the car was a good one, and kept well iced, the temperature should not have been allowed to go above 40 degrees on board the car. If there was proper care taken by the transportation company in unloading from the car to the boat, then the temperature should not have been allowed to go much below 40 in the process of loading and unloading. How was it that the temperature in that compartment was 54 at the beginning ? Something must have been wrong. Either the compartment in the boat was not at a low enough temperature, or the fruit was at too high a temperature when it entered the boat. I have been told—I do not know whether it is correct or not—that the apparatus for refrigeration on board the vessel is not always in good working order when the vessel is in port ; that the engines are sometimes started some considerable time after the loading of the fruit on board the boat. I just mention this as a question. I do not know the truth of it, but if it is so, can it be remedied or can it not ? Now, these boxes in which the fruit is packed are 5-inch boxes, with good wide cracks both at the top and at the bottom, so that there is abundant opportunity for the cold air to get in there very quickly, and I do think that in less than three days, if the refrigeration apparatus on the steamship is strong enough, the temperature might be got down so that in the heart of one of those boxes it would be as low as 40 degrees in that time. It is entirely different from a barrel of apples closed up in a so much larger package. These boxes were so open. I wish to speak of the shipment late in the season in the Hanrahan car in 1900, I think it was. It was stated that, although these pears were shipped in November, yet they arrived in very poor condition, although the weather was cool enough, so that they

should have carried on the deck in excellent condition to England without any refrigeration, although pears picked at the same time, from the same trees, were kept, without any attempt at cooling, in the ordinary temperature in my barn for a number of weeks. Now here is the trouble. I know as a fact that the temperature on that Hanrahan car was above 60 degrees—if I remember the figures, 66 degrees—the day before it left Grimsby, and it had been about 60 degrees for some considerable time. The fault was not in the car ; the fault was that there was not any ice in the car, or that there was so little that it was impossible for any car made by Hanrahan or any other man to keep the fruit at a proper temperature. That fruit was spoiled before it left Grimsby. Is it any wonder that it arrived in bad condition on the other side ? I do not blame the Hanrahan car, I think it is all right, and I do not blame the Hanrahan compartment on the steamer. I suppose it is as good as any other and not a bit better. I have never been able to see that the Hanrahan has any virtues above any other good system. The Hanrahan car is better built than the most of the old cars that come our way ; it is a new car ; it is a grand car, and I would rather put my fruit in it than in any other of those that come our way, but that is because it is new and well constructed, and not because of anything in the system that is better than any other system. Other systems permit circulation just as well as the Hanrahan system, to my mind, so that I think if we would get right to the bottom of these things a great deal of trouble lies, as the Professor said this morning, between the top of the tree and the consumers' teeth, and not on board the steamship altogether, although I do think that at that one point between the G.T.R. car and three days out we should not have such a rise in temperature as we are told of, if everything has been right up to the arrival of the car in Montreal. I do not see why the temperature should ever get above 45 on board the steamship, and it should be down to 40, I think, within 24 hours; and in one of the thermograph records that I saw, unless my memory fails me, the temperature did get down to 40 degrees within twenty-four hours after the time it got out. There are a great many of these little things that we have to examine most minutely, and that we have to be careful of, we shippers, just as well as the steamship companies, and the unfortunate thing is that one little mistake made at the beginning or in the middle will destroy all the carefulness that we exercise all the rest of the way through. (Applause.)

E. D. Smith : I see that you have me down for a paper to-morrow on exactly this same subject, and I would suggest that I make a few remarks now, and not have the paper to-morrow. I did not come prepared with a paper. I saw that Professor Robertson was on the programme for this address, and I supposed a discussion would follow that would cover the ground. This is one of the most important subjects that we can discuss—the transportation of our surplus products to British markets, or to other markets for that matter, for it is just about as difficult for us to land some of our fruits in good condition in the Northwest as it is in Britain. The subject is divided, as Professor Robertson has well stated, into two departments : that of the apples which go without cold storage, and that of those perishable products which require cold storage. Taking up the subjects in the order that Professor Robertson did with regard to the shipment of apples, most of the gentlemen in this Association will agree, I am sure, with the Professor when he states that they have been urging on the Government for years to do something in regard to exhausting the warm air or pumping in cold air into the holds of vessels carrying apples across the Atlantic. The statements read last night and this afternoon by the Professor with regard to the loss and damage on shipments of apples, I am sorry to say, will continue in some places. This year from the port of Halifax—from which, I understand, there have been none of those ships sailing that have been fitted up—there are just as bad results as there were four years ago. I am delighted to hear from the Professor that the Department has carried into effect what they proposed to do last winter, that is to test this refrigerator plant in one compartment of the vessel, turning cool air into the other compartments where the apples are stored. The only criticism that I ever felt like making to that project was that it might be a little difficult to get the steamships to take this matter up on account of the

cost, and Professor Robertson has stated that that is the case. We have always believed that it was only necessary that the hold of the vessel in which the apples were stored should be at the same temperature as outside the vessel. We know that at the season of the year when we ship the apples the temperature on the ocean is at least cool. From the data gathered this season, as stated by Professor Robertson, sometimes it appears it has been as high as 77 degrees. I am a little surprised at that, and imagine that that temperature must have been very seldom, and possibly in the St. Lawrence before the ships got into the ocean.

A Delegate : It might have been crossing the Gulf stream.

Mr. Smith : I should not think it would have been as high as 77 degrees even crossing the Gulf stream, and he says as low as 44 degrees. I should like to know what the average or general temperature would be. I should imagine it would not be more than 55 degrees or 60 degrees. In such a temperature we who handle apples know that apples will keep a long time. We know that these same apples lying under the orchard in barrels, exposed to sun, at a temperature often up to 85 degrees and 90 degrees in the day, at night down to the freezing point, subject to the exposure from rains and all sorts of variation in the temperature ; these apples lie there on the ground in barrels for a month without being soundly packed, whereas shipped on the vessels according to the methods in the past, one-half or two-thirds of them are damaged to the extent to lose 50c. or 75c. a barrel at least on their value. This is being remedied by the exhaust fans. I would like very much to have had data presented by the Professor to show the condition the apples arrived in from these vessels, and compare it with the condition in which they arrived under the old system. I am sure every grower of apples in this country must feel grateful that the Government has taken this matter up, and has made a good start at any rate, and others of us hope that before another season passes by a sufficient number of vessels will be so fitted to carry all the product from the farms of Canada. I remember that last winter in the House of Commons there was some objection taken on the part of some of our Nova Scotia friends that the grievance was chiefly from Ontario, and they insinuated rather roundly that it was the fault of our apples. Well, I hold in my hand a return from some of the steamships sailing from the port of Halifax this season, and just to corroborate what has been going on here before I will state that in the steamer Evangeline, which sailed for Liverpool October 28th with 1,460 barrels, the report was as follows :—"Tight, 1.202; slack, 220 ; slack and wet, 38; and the report said that almost half the barrels arrived in a wretched condition, and sold from 50c to $1 a barrel less than others. The Grecian had 875 barrels tight, 189 slack, 68 slack and wet ; so more than 20 per cent. of the cargo arrived in hat wretched condition. From the port of Montreal I have very little data, as I was not doing business from that port, but I have heard a statement of one carload that went on the Lake Ontario—I do not know whether that was one of the vessels that was fitted up—and there were 141 tight, 24 slack, and 23 slack and wet, so about one-third of the cargo was in bad condition. The Persian, that sailed from Montreal, had 779 tight, 477 slack, 24 wet and 18 slack and wet—not nearly so bad as those from the port of Halifax, but bad enough. This loss has been going on from year to year. I believe half a million dollars a year has been lost to the farmers of Ontario directly, besides the indirect loss, which is something beyond computation, because we heard from Mr. James about the bad condition of some of the orchards of Ontario that were neglected, and a great many of the trees that had to be rooted up. Well, what is the reason ? Why is it that the farmers are not caring for their orchards ? Merely because they have not been able to make them pay under the treatment that they gave them. If these farmers had been getting 50c. a barrel more for their apples during the last ten years than they did get I believe the farmers would have been delighted, and would have thought it was a good investment to spend some money on their orchards, but in the last two years they only got 40c a barrel for their apples, and they quit taking care of their orchards. Not only that, but these men who become discouraged cease planting. Now I think our exhibits at Buffalo, and in the last twenty years, show that if our Province is capable of producing anything well, it is capable of

producing apples well. We have a climate that is unsurpassed in America for producing apples, and we have a market in Britain and the Northwest for those apples that is unsurpassed, and the market is distant only ten days' journey. Under such conditions as that one would naturally say that the most profitable thing and the best crop for the farmers of Ontario to grow is apples; and they would do it if they could make it pay every year, and I am sure they could make it pay if they are once transported to Britain in good condition ; and if these improvements that have been introduced this year have been carried out fully and put in force on as many vessels as possible, a sufficient number so that everybody can take advantage of them, I am sure apple-growing will take a stand vastly different from what it has in years gone by, and become one of the most important industries. We have ten millions of apple trees set out. Anyone who is an apple grower will readily compute how much the product would be at paying prices if they were properly cared for, and what a large income it would be for the Province of Ontario. Taking up the other matter, that of cold storage, that is not equally important, still it is a matter of great importance that we find a market for our pears. It seems to me from the experience we have had, that pears and summer apples are about the only fruit that we may expect to be able to land in Britain in good condition and find a ready market there for them. I do not know that we will be able to put our peaches there, except one or two varieties. I believe we can put Elberta peaches there ; but our experience so far has not been satisfactory. Where the fault lies, it is the part of this Association to thoroughly investigate and discover. The shippers at Grimsby who have shipped many times had bad returns, but they knew and felt sure that they had put those pears up in proper condition, and had such wretched returns from them that they felt the fault was not with them, but must have been with somebody else, and I can sympathize heartily with Mr. Woolverton in making the statements he has made from time to time. He is surrounded by those shippers, and every time they get those bad returns he hears in both his ears very loudly these bad reports, and he is impressed that there is something wrong somewhere, and he is sure from his experience there that it is not in the packing, and he naturally concludes it is in the cold storage. He knows, as we all know, that any fruit as hard as pears, if it is kept at a temperature of, say, 50 degrees—and that is the highest, I think, that has been stated that those pears were at from their journey from the farm to the ship—ought not to perish very rapidly, even after the three or four days that are wasted from the time they left the packing house until they arrived on board the ship at a temperature of even 50 degrees or 55 degrees for three days. Taking up my own shipment this season, it was a very disastrous one. I know that those pears were packed hard and firm, as they ought to be packed ; I superintended the packing myself. I know, as well as I know I am living, that those pears were put up as hard as they ought to be put up. To put them up harder than they were they would shrivel and never ripen, and the proof of that is in the culls that I took from those pears. A good deal has been suggested about the small pears. I am the guilty man that sent the small pears. I wished to find out whether a small pear that was perfect in other respects, a smooth pear that was free of worms and scab, but simply small, would sell in the Old Country market at a proper price, so I sorted those pears into four grades. First I took out what I would call the culls— that is, those that had knots on them or showed any tendency to be ripe, which indicated that they were worm eaten—at that season of the year there are none ripe except those that have a worm inside. Those were taken out. and of the rest of the pears I shipped 555 cases. I took 650 baskets of culls out of that lot of pears, or just about one-half of them. These pears were bought from the farmers, all for first-class pears. This is one fault I have to record about pears—some men seem to think that we must not send anything but choice pears. Now if you go among the farmers and buy first-class pears, and insist on them taking out the culls—and that is the way my pears were bought, they were not supposed to have brought to me any that had serious knots on at all, and I cannot say but what they did just as the agreement called for—those pears were delivered there, what is commonly called on the Canadian market first-class pears. I divided them into four classes, and took out one-half of them, 600 baskets

out of 1,200, to be culls, and put them in my own cold storage plant, and those pears stayed there six weeks, or three weeks after the others landed in Britain, and I sold them to the canning factory at Grimsby, and the manager said, "I can't take those pears, as they are ; they are too hard; you will have to ripen them." I took them out into the ordinary temperature, and they stayed there four days before they became sufficiently ripened that the canning man could can them at all ; but the pears that I packed, the three grades—firsts, seconds and thirds—I divided them into three sizes as near as could be done with the eye; 1¾ inch is a very small pear, of course, but I expected to make good returns in the Old Country market. My own opinion would have been to send only first grade, but I wanted to test it, and was willing to test it if it was a loss. The next grade was 2-inch., the third was 2½-inch., the part which was really first-class pears. The report I got from the Inspector in Montreal when they landed there was this :—"1¾-inch, rather small; the medium grade, 2-inch, appears all right; the select pears a little slack." Now, when they landed in Britain the astonishing thing to me is that the little pears were the only pears that paid me any money. Here is the account sales :—40 boxes, 1¾-inch., at 4s a box, about 96c; it cost about 50c expenses out of that, which left me 46c for the third grade pears, which are only worth in this market about 20c or 25c. Then the medium grade pronounced all right by the Inspector. 44 boxes that landed sound sold for 3s; and the select pears, that were certainly select, 58 boxes sold for 2s 6d. Now those are some of the things that we cannot understand, and we are seeking for light. I cannot fathom it. The only solution I could possibly give for it is that the small pears were harder, so I think my experiment in sending the small pears was justifiable. I would not like to repeat the whole experiment. for it cost me $330, and I got $48 out of it. Nevertheless, it shows that there is a good deal in this subject that we do not thoroughly understand. Now, whether these pears would have ripened so much between the packing house and the vessel or not I am not prepared to say. I know those pears were packed hard ; they were taken down to Grimsby and put into the cold storage room, which was not as cold as it ought to be, as I understand from my man, from the fact that a great many were going in there, and the doors were open frequently. They were then put on the car, which was rather overloaded; there were 1,000 cases in the car, which is a pretty big load to put in a refrigerator car and get the temperature down as low as it could possibly be got.

The Secretary : They were put in two cars.

Mr. Smith : That is what should have been done. Then, if they were put in two cars I do not see why they should have suffered on the cars, and why they should not have arrived at Montreal in good condition. However, there is how we stand, and it is unfortunate. Other shipments later in the season have always turned out profitable. I shipped some last year, and my Bartletts turned out like this, while later on they turned out well ; the Duchess and Anjou sold at a fair price. I have no agent over there representing me. I ship to the commission merchant. There were 58 boxes that arrived in first-class condition of large pears that only brought 2s 6d. It does not say the condition, it says 58 sold at 2s 6d.

Mr. Shepherd : If you have not somebody to represent you there outside of the commission man, my experience is you will never get satisfaction.

Mr. Smith : I quite agree with you there in every respect. The reason I shipped to the commission man was simply this : I have an agent in Manchester, and I got this shipment up to send to Manchester, intending to send a full cargo. I made application to the Manchester liners for space, and asked them if they would guarantee me some temperature, but no, they would not name any temperature ; they would not guarantee anything, the shipper must take all responsibility ; they take the pay for carrying these goods in their cold storage plants, and charge well enough, too, but they take no responsibility, and I would not ship unless they did that. I sent them along with the Government shipments, understanding that this ship was under a guarantee with the Government to maintain a certain temperature, and that was the reason I changed my shipment directly to a customer, to be sold on commission, which I do not think I will ever do again. But there is the difficulty that we are in, and so far as the perishable

fruit shipments from Ontario are concerned I do not believe we will need very much cold storage space, unless the ship-owners make up their minds that they are willing to take some responsibility and guarantee some sort of temperature somewhere within reason. Let them guarantee a temperature from 34 degrees to 44 degrees if they like—it ought to be closer than that; but even with that I would ship any quantity almost; I would test the market. I believe the market is there. I believe we can sell any quantity of pears there at a profitable price when there is somebody there to look properly after it; but when there is no guarantee of temperature, and the shipper does not know but perhaps they are going to be frozen—as we have been told by some shippers that they have been frozen—when you do not know whether they are going to be roasted or not, you cannot find any shipper willing to assume the responsibility of going into it. Now, I do not know that our Government can do anything more than they are doing; that is to say, exposing to the public their shortcomings; but there is the condition which we have to face, and until we can get a guarantee of some temperature I do not believe that perishable products will be sent from here in very large quantities. Professor Robertson spoke of California peaches and pears going forward in good condition, but we must never forget that a California peach is dry, and will ship almost like a turnip, or a Keiffer pear, anyway. You can put a California plum on a stand in a store here and it will stay for two weeks. California has a rainless season practically, and their fruit has not the juiciness that our Ontario fruit has in our climate.

Mr. Boulter: How is it the Michigan peaches will stand better in shipment?

Mr. Smith: I was not aware that they would. You have had an experience in it. There are some varieties that will carry better than others. Even our Elberta will carry very well. I am seeking for remedies and light on this matter. There is a fault somewhere. The growers are inclined to lay it on the cold storage, which is away off across the ocean. The Department is there, and they are apt to blame the growers and the packing. Now there may be men who pack fruit too ripe; I do not doubt from the evidence we have had that some was put up that should not have been put up, but I do not think the fault is in regard to ripeness; the fault lies somewhere between the packer and the salesman on the other side. (Applause.)

A. H. Pettit: One other point I would like to inquire into. I understand from Prof. Robertson that large quantities of Bartlett pears were shipped from Montreal on the same boats on which our western pears are shipped. Probably the Bartlett pears from Montreal are better keepers than others. I would like to know whether those pears came from the Province of Ontario by baskets and boxes, and were repacked by the Montreal people. Now, if they in Montreal can get our pears from the west and repack and reship them and get them in good condition, I do not understand why we cannot do it from Ontario, where they are put up directly from the orchard and put into cold storage.

Mr. Smith: Were they Ontario pears?

A. H. Pettit: They surely were not Californian, and if there is a Montreal gentleman in the room I would like to ask him how successful they are in growing the Bartlett pear in Montreal.

Mr. Shepherd (Montreal): They can grow the Bartlett pear, but they are not grown to any large extent. I am not aware that there is anybody who exports Bartlett pears grown in and around Montreal. They are not grown commercially to any large extent. The Flemish Beauty is being planted out around Montreal to considerably larger extent every year, and they are succeeding very well. I visited the Trappist Monastery with Professor Freeman in the first week in September this year, and we saw there, I think, fully 50 trees of Flemish Beauty that were bearing most admirable specimens of this fruit. I was going to make a few remarks about this cold storage question. I have had a little experience in exporting first-class Fameuse in boxes for the last twenty years, and although I have not made a practice of shipping in cold storage, yet I utilize cold storage in this way. In the last five or six years I have had considerable experience. In the first place let me tell you that if you allow an apple to get what we call ripe, fit to eat, no amount of cold storage will keep that apple any length of time;

in fact it will decay more rapidly. If you wish to ship first-class table apples in good condition you must start the fruit in good condition from the very beginning. (Hear, hear.) You must pick your fruit at the right time. I pack the Fameuse in boxes that perhaps some of you remember, in this shape (engraving shown) like an egg case. You must pick them before they are ripe. You must line your case. You must use a packing table that is only a frame covered with canvas. When the pickers come with their baskets they handle them like eggs ; I try to instil into my pickers the idea that they are handling eggs all the time. Then they are packed in the boxes at once, which are nailed up that day and sent to cold storage the next day. The fruit I am shipping to England I try to send to cold storage 48 hours after it is picked. I consider that is a first principle. You must start right. Another thing I have gained by an experience of some years in putting fruit into cold storage is that I do not ship from Montreal in the month of October, when the temperature in the streets is above 50 degrees; that is one of my rules. In the month of October frequently in Montreal we have it up to 80 degrees outside on the shady side of the street, and in the third week of October in this year it was 75 or 80 for a whole week. I did not ship an apple that week. I did the most of my shipping this year in the month of November, and I have not had any complaints at all ; in fact I could read you letters which have been sent to me from people who have received the apples which speak very highly of them, though I have never asked for the letters. I have given up commission men a good deal. I tried that for some years. Prof. Van Deman mentioned that it took about a week for an apple to get a temperature to the inside of a barrel in cold storage. I will prove that fact in the inverse way. About the 15th of August, 1900, I sent to the cold storage 21 barrels of green Duchess. My intention was to ship them in cold storage to Liverpool to sell as cooking apples. They were uncolored Duchess on the green side. Apples of that class were selling in Montreal on the 15th August, 1900, for about $1 a barrel. I arranged with a ship of the Dominion Line to take them into cold storage about the 29th inst., and left orders with the Union cold storage people to ship them by the steamer Dominion in cold storage. I left for Ottawa that night and did not return to Montreal for two days, and when I went to the office of the Dominion line to prepay the freight they told me that those 21 barrels did not go in cold storage. I said, "Why, I made that arrangement with your office, and surely the cold storage people did not ship them in the ordinary compartment on the 29th August, when it was 80 degrees outside ?" They said, "Yes, they went in the ordinary compartment," and added, "When they came down we had no cold storage except for butter, which was too cold, and when the carter telephoned to the Cold Storage Company they said, "Let them go !" I said, "I am sure I shall not get enough to pay for the freight for this lot of Duchess." I shipped when the temperature was 80 degrees ; they could not possibly arrive in Liverpool and be anything but mush. But, to my astonishment, when I got my returns from Liverpool they were billed at 10s a barrel, and the only explanation, I think, is this, that the fruit, having been 14 days in cold storage, was so thoroughly cooled that they did not get too warm by the time that they arrived in Liverpool, and they were sold at once. (Hear, hear and laughter.) That was a considerable experience. But then I may say this, that that lot was 20 barrels, although there were 21 sent down. In November last year the Union Cold Storage Company telephoned to me that there was a barrel of Duchess in cold storage, and I went and opened it, and it was in the same condition as when it had gone in. I determined to try an experiment. In January, 1901, I left for Ontario with my wife, and left orders with the Union cold storage to sell that barrel of Duchess at the next auction sale of the fruit exchange. I got my returns when I was up in Owen Sound a few days afterwards. That barrel was sold on the 18th January for $2.50, when, if I had sold it in August, I could not have got more than $1. Well, that gave me considerable insight, so this year I have a lot of Duchess in cold storage, and I am not going to sell them until about Christmas time and they are on the green side, of course, cooking apples. But it cost me considerable to find out this, and I have learned that if you put an apple into cold storage when it has arrived at the condition which we call ripe, good to eat, it is too late to keep that apple in cold storage.

You must take it before it is in that condition, and send it to cold storage at once, not keep it at your farm, and it will keep for months. Everybody does not know that, but it cost me $50 to learn it.

Mr. Dawson (Toronto) : I have had considerable experience in taking apples out of cold storage and shipping them by ordinary freight to England, and I have always made it a point to find out what compartment they went into. Every time they went into the forward compartment below the water line they arrived in good condition, otherwise they did not.

R. J. Graham (Mayor of Belleville) : I have had some experience in cold storing apples, and having cold storage of my own and dealing in apples, and I have found that what Mr. Shepherd stated was strictly correct. Apples put in cold storage, if they are ripe—that is, fit to eat—will not keep in any cold storage, I do not care what temperature you may put them at. I have in my storage now apples from Missouri that were picked in a temperature of about 100 degrees, that were gathered in perfect condition and as large as could be, and brought to Belleville, and they are now there, and have been there since the first week in September, and I have no doubt that those apples would keep there indefinitely if a proper temperature was maintained. I believe that a great many of us who store apples with cold storage people blame the results when the fault is our own. We gather the apples, leave them in the orchards sometimes for weeks, and possibly in some cases nearly a month after they are picked from the trees and left under the trees on the shady side in most cases, and then send them to cold storage along about the 1st of November, and expect the cold storage to keep those apples. Well, it will not do it. Apples as soon as they are gathered from the trees should go at once into cold storage, otherwise you might just as well keep them in any common storehouse ; and I think that thousands and thousands of dollars are lost to our fruit exporters by the mismanagement of their fruit. This year I have some thousands of barrels in store for dealers who failed to send that fruit down till away along in November. Well, now, they cannot expect that that fruit will go out in the same condition that it would had it been put in in the condition it was when gathered. It will go out at a loss unless the market is in their favor. Duchess or Astracans, or any tender varieties, if they are gathered when hard and firm, put at once in store at a temperature of 30, will carry for an indefinite length of time. People differ as to the temperature at which apples will keep in cold storage. I have been experimenting for three or four years in that line, and I find apples will carry at 30 degrees, and will not freeze, and they will keep in splendid condition. It has been stated by some who have stored apples that they much prefer them carried at 34 degrees to 36 degrees, but my experience is that at a temperature of 30 degrees they will keep best, and carry in first-class shape.

E. D. Smith : Would the fruit itself be exposed, or in barrels ?

Mr. Graham : In barrels ; but this year, to satisfy myself on that score as to what temperature apples would freeze at, I ran a room down to 29, and left some apples exposed in an open box, and I kept that room at 29 for a week, and they did not freeze. I had a little experience this year in shipping apples in cold storage to Liverpool on the steamships from Montreal, and I must say the result was very unsatisfactory. If the proprietors of the steamships do not regulate their temperature better than they have this past season it will not pay us to use their space. I would very much rather have the forward hold below the water line, as Mr. Dawson suggests, in common storage, than the present system of cold storage on the steamships. They charge a high rate on it, and guarantee nothing, and give us very irregular temperatures. Now, a temperature that varies from 25 degrees—in some cases I have found it to go down to that and all the way up to 40, is very much worse than a temperature of 40 degrees all the way through. Irregular temperature up and down will invariably spoil anything. It has been stated that fruit will spoil much quicker out of cold storage than it will if it had never been carried in a temperature so low. I have had considerable experience in that line, and I believe that apples carried at a temperature of 30 degrees and then taken out, even in

warm weather, say at 80 degrees, will keep much longer than if they were gathered off a tree and never had been chilled. I am quite satisfied of that.

Geo. E. Fisher (Freeman) I would like to ask Prof. Robertson a question. I understood you to say this morning that the intermediaries who stowed the fruit on the vessels, and those who kept the temperature right in the compartments, did not fail to do their duty. Now, how do you know this ?

Prof. Robertson : I was speaking of the cold storage. The records which the ships' engineers give tally with our thermographs, which are independent and locked in the chambers. That is the evidence I have, which is, to me at least, quite satisfactory.

Mr. Fisher : In the last shipment that went in cold storage from Burlington to Glasgow the report from the receivers is that some of the packages had ice on the outside of the packages when they were delivered, and when they were opened they found ice on the fruit, and when this fruit was sold it sold at very irregular and unsatisfactory prices. Some of it was all right, some of the prices were good, but the majority of the prices were very low, and we found ourselves short several hundred dollars in the shipment. We would like to know the reason why.

Prof. Robertson : I think Mr. Fisher will remember that he sent me a statement of that, and I forwarded the statement at once to the steamship people. The ship happened to be in port with the ship's engineer, and they sent back the full statement of the log and the captain's and the steamship's engineer's statement that the fruit was evidently, from its appearance—they did not open the cases—in good condition when it was delivered in Glasgow. That is all I know about it.

Mr. Fisher : Yes, and his statement says that the receivers approved. Now these statements conflict, and who are we to believe ?

Prof. Robertson : Well, I suppose it is between those two Scotchmen ; I do not know. (Laughter.)

Mr. Fisher : The gentlemen we have been dealing with in Glasgow for the last ten years are people in whom we place a great deal of confidence, and we are disposed to believe them, and we believe that the fruit was not fairly treated on board the steamship.

Prof. Robertson : I may say this is the position of our Department, at any rate. As soon as we were able we got thermographs, which are self-registering thermometers. We were not able to have more than thirty of these in use before September this summer. We have thirty more now, and will have several more next spring. Now, any shipper in cold storage hereafter who writes and gives the facts will get a copy of the thermograph chart—that is the best we can do—and the report of the inspector at Montreal and at the landing port on the official form. Notwithstanding these there may be differences of opinion and mistakes, but we will furnish that information, and if we can get more I think the Department will try to meet the situation.

Mr. Fisher : Have you an agent in Glasgow whose business it is to see these goods unloaded ?

Prof. Robertson : Yes, who does nothing else—Mr. J. B. Oak, an Ontario man—who sees every ship unloaded, and who watches that the goods not in good condition, when they are put out, are properly handled.

Mr. Fisher : We feel that goods with ice on them are not fairly dealt with, and that ice is found on the fruit when a package is opened looks worse still.

E. D. Smith : I would like to ask Prof. Robertson if he is sure these thermographs cannot be tampered with in any way ?

Prof. Robertson : Oh, they are quite safe. There is a drum around each ; there is an arm with a pen-point that goes up and down as the temperature varies, and the drum turns once in fourteen days. The pen-point will register on the drum as the temperature varies. The thermograph is put in an oak case filled with holes, so that the air will get around it. That is locked in Montreal, and the key is kept in Montreal. There is no possibility of tampering with them. Our agent at the other side takes it out.

Mr. Fisher : There is another question I would like to ask in regard to the most suitable package for putting the fruit in for cold-storage purposes. Is a tight package or a ventilated package best? We have in use what we consider, and what you yourself have said, is the very best package that we can have for our purpose, and we have used that package for a number of years and found it very satisfactory for export; but this year I put a considerable quantity of Bartlett pears both in a non-cold storage in Montreal and also in a cold storage building in Toronto, and in those packages. The pears were put into cold storage about the 1st of September, and they were not examined until about the 1st of November. They were there about two months; when they were put in I had prepared three boxes as tight as they could be made of about the same size, scarcely as large as those packages that were used, and we lined these boxes with heavy wrapping paper, placing the paper in the boxes. The sheets were large enough to fold over the top, and when the cases were filled with fruit we doubled over the end of the paper and nailed on the cover and made it almost air-tight. Those three boxes were placed in a cold storage building in Toronto at the same time as the others were put in, and were not examined until the 1st of November. The ordinary cold storage package that we used had the fruit considerably wasted, but when I opened these tight packages I found the fruit in splendid condition, and it required to be exposed to the heat of a stove for several days before it was in eating condition. Now if a tight package is preferable to a ventilated package for cold storage purposes it is worth knowing.

Prof. Robertson : There is no one package that will suit all kinds of fruit or all kinds of uses. The reason we do not recommend or want tight package for pears intended for shipment is this, that there is no means whereby you can cool down pears quickly, at least for immediate shipment, if you put warm pears in a tight package. If you have only a few boxes in a large cold storage building you can cool them down very quickly. It has been shown by experiments in Washington that it will take a week to cool down apples in a barrel. We wanted pears cooled down in two days. I think that pears will keep better in an ordinary compartment in a tight package.

Mr. Fisher : I think the experiment is worth carrying further. It would seem to me from our experience and what little I have learned from outside sources, that we should know more about the merits of a tight package. Mr. Shepherd says that he packs his apples the same day that they are picked. That, in my experience, has been found to be a very bad practice; I never do that. I prefer to leave the fruit exposed to circulation at least one day, so that the heat of the sun can get well out of it. We like to have the individual specimen reduced to as low a temperature as possible before they go into the package; I think that is the right idea.

Mr. Shepherd : Allow me to explain; I was talking of apples packed in boxes.

Mr. Fisher : Well, we never use anything else.

Mr. Shepherd : My experience is that the sooner they get into cold storage the better; and also I have no faith in open boxes for apples. I have never tried pears.

Mr. Fisher : You like a tight box?

Mr. Shepherd : The tighter you can get them the better. My box, as you will see, has ventilation in finger holes like a beer case.

Mr. Fisher : We have had our boxes made in that way for years, but we did not cut through the boards.

Mr. Shepherd : I am going to have an absolutely tight box after this. The tighter they are the better they carry.

Mr. Graham : I think you will find it makes a great deal of difference as to what kind of apples you have in storage. I tried some experiments on that with a crate made of lath, and I found that some varieties, such as the Greening, would carry better in a crate, while the Russet would be very much better in a tight package. (Hear, hear.) I am thoroughly satisfied you can carry a Greening very much better in cold storage in an open crate than you can in any kind of a tight package, and it will not discolor when it comes out. Take an ordinary Greening in cold storage, and take

it out any time after being in a tight barrel. and under ordinary circumstances that Greening will turn brown. It wil discolor on the outside; so will the Grimes' Golden.

Prof. Saunders: What variety was that you spoke of as having come from Missouri?

Mr. Graham: I have Ben Davis and Missouri Pippin and Wine Sap and Jonathan. I think experiments carried on along that line will be valuable to an Association like this.

Mr. Thompson: Are those thermographs placed only one in each compartment?

Prof. Robertson: That is all that have been placed so far, and not even one in each compartment.

Mr. Thompson: It would be wise in future to put one in different portions of the compartment, in view of these conflicting statements, to see if they will tally.

Prof. Robertson: We will do that in a few experimental compartments. The smallest compartments I know of holds two carloads, and they run from that to four carloads, and they run up to 5,000 cub. ft. Some of them were even bigger than that on the Bristol Steamships. It has been suggested that I say a few words to gather up a few points that have been gleaned from this discussion. The shipment from Grimsby this year make it quite evident that if you take any quantity of pears coming in from growers the smaller pears are harder and less ripe than the large pears in the same packages, and to my mind that both explains and throws light on the reason why these small pears sold for 3s a case, whereas the large pears sold for very much less, because they were in a riper condition, further grown. Now I got a letter even since I spoke this morning about another shipment on that same ship. This is another Canadian shipper who sent pears on that same ship and he says:—"The fruit when packed was in good condition, but was a long time in reaching the market on account of waiting for the boat, and arrived in a somewhat over-ripe condition. The best sold at about 4s a box." Those were also Bartlett pears from another Canadian shipper on that ship. The gist of the whole thing to my mind is this—that is what I have been gathering the last year or two—that when any fruit gets to a certain stage of ripeness cold storage will not arrest the changes that go on, though it may perhaps delay them. but if that fruit is put into cold storage in such a firm, sound, green condition with that degree of ripeness, when this ripening and inter-cellular casein and such things are there, then the fruit can be held almost indefinitely, and it is a question about getting the fruit into cold storage in that state. We have been discussing the desirability of having an experimental cold storage built for that purpose, which we hope to have at Ottawa this next summer, to discover the various tempertures at which things can be kept safely, and the various degrees of ripeness in regard to fruit and cheese and other things that will make it possible to keep them. That seems to be the one thing we have learned from all our experiments that was not before known, and the guidance we have learned out of this discussion. One thing more, that if you have coming out of cold storage, in England, tender or other fruits at a temperature of 35 degrees, 36 degrees, 37 degrees, into the ordinary atmosphere any time before the middle of October, or even before the end of October, you take a risk of the fruit condensing on its surface so much moisture as to make it spoil; and so for apple shipments you will find it much safer for the tenderer sorts to cool them thoroughly in the cold storage and put them in those circulating chambers where the atmosphere never goes below 45, and then after an ordinary space to go into some place where they will be brought to 50 degrees or 55 degrees and landed in a firm and dry condition. I think we are on the way to make a good deal of progress in these matters, and I have nothing to add to what I said this morning beyond this one remark, that above all men in Canada in this Convention I have no reason to or no desire to impute motives to anyone except that they have been seeking to benefit all the fruit trade of Canada in the interest of the Association at large (Hear, hear). When I cited these things from the Horticulturist I did not make a single qualifying observation that would indicate that anyone was wilfully doing wrong, but the statements were

in direct conflict with the facts which I thought it needful to bring before the Association, and therefore I had no thought that Mr. Woolverton, above all men, was seeking to do wrong or mislead, but one particular statement in the "Horticulturist," that relating to the shipment on the "Manchester Trader" and the other ships fitted up by the Department, was so thoroughly misleading and had been brought to the attention of the writer ten months ago, that it was needful to make it public to have it right, and that is why I took the liberty of bringing it up to-day, both by my own feeling and the Department. I had no feeling towards Mr. Woolverton, and I hope that good will come out of this discussion both to the Association and to the fruit industry, and I thank everybody for the patient hearing and for the kindliness of the discussion. None of us have anything to gain except good to Canada and the gain they will get from the general prosperity.

Mr. Boulter : I have listened very attentively and with great pleasure to this discussion of cold storage on ships. I understood you to say this morning that the Railway Companies did not or would not make any changes in the present refrigerator cars. One reason why the California fruit is carried so well is because of the refrigerator cars of the California Fruit Exchange, which are labelled "C.F.X." One of the largest commission men in Toronto told me that he has kept peaches, pears and plums coming from California on the track for ten days perfectly sound and good. You stated that the losses, if any, would be caused by the doors of the cars not being properly closed. Last year I bought a car of Bartlett pears from Mr. Smith, and he took them out of the cold storage and put them in a refrigerator car, and after a passage of three days all the pears were damaged very seriously, though not exactly spoiled. There was no delay in that car, because Mr. Smith and I arranged for the rapid transhipment of it, and also for the ice being in it. This year I bought a car of peaches in Toronto, and they were brought over on the Lakeside to Toronto from St. Catharines and shipped that night on the Grand Trunk refrigerator car, with ice and all, and over half of these peaches were spoiled. Now are we to know that our refrigerator cars to-day are not up-to-date and will not carry our stuff from St. Catharines or Grimsby to Montreal in perfect condition while the California fruit is brought in good condition after ten days' travel ? This is a fact. So much so that I have had to ship large quantities of pears by the Richelieu boat. Too much blame should not be attached to the vessels with cold storage. because no doubt the goods do not get there in a proper state.

Prof. Robertson : There are two difficulties. The Railway Companies tell me that the latest cars they have built are built almost similar to and quite as good as the California cars, but as a matter of fact they have cold storage cars that were built twelve or fourteen years ago, and these cars will go around into local service, and so while they are building refrigerator cars now for us as fast as they can of the newest and latest style of insultation and cooling, still the old refrigerator cars are on the routes and I think the losses come from them.

Mr. Boulter : Both of those cars I referred to were new cars. We would not take chances of an old dilapidated car, and that is the result.

The President : This is a very important subject. We gave all the forenoon and a part of the afternoon to it, and we will now have to shut off any further discussion of it. We have had a flood of light, and we find we are working on the right lines. I think it will not be long before we have a perfect system.

FREIGHT ON FRUITS.

By H. W. Dawson, Toronto.

I am proud to state that I have the honor of being the son of the man who shipped the first carload of Canadian apples to Europe something over 35 years ago (Hear, hear). He packed them in a very primitive way, and even during the first five years was very successful. He packed them by using a rail as a lever, a chain attached round the tree in the orchard, for pressing the head in. Since then great improvements

have been made, and I have seen the export trade in apples grow from its infancy, and possibly I know as much about it and probably have handled as many apples as any man in the trade. When asked to address this Convention on freight rates, or upon the question, why should a barrel of apples pay more freight than a barrel of flour ? I did not realize that the apple was discriminated against to the extent that it is ; neither did I think that fruit of all kinds was discriminated against to the extent I find it. I will not attempt to answer the question myself, but will give you some of the replies given me by railroad and steamship officials, and intersperse some little personal experiences by way of comparison as to whether their replies are warranted by the facts. Perhaps before giving you these replies or experiences I had better establish the fact that a barrel of apples does pay more freight than a barrel of flour. We will take London, Ontario, as the basis of operation. During the year 1896 the freight on a barrel of apples to Liverpool was $1.07.47 to $1.31.67, and to Glasgow $1.47.27; and flour to the same ports was 72 cents. Late in the season the rates were reduced to 98.47 cents and $1.23.67. In 1897 apples paid 92.78 cents per barrel ; flour 60 cents per barrel. This year apples via Montreal paid 80.78 cents to $1.08.18 and flour 38 cents per barrel ; and at the present time via Portland or other Atlantic ports, apples pay 76.58 cents and flour 38 cents per barrel. In 1896 the freight on a car of 150 barrels of apples was $161.20 to $220.90, and on a carload of flour $108, the car of apples weighing 24,750 lbs., the car of flour 30,330 lbs. a difference of from 50 per cent. to 109 per cent.; but if both paid freight according to weight the difference would be 62½ per cent. to 136 per cent. This year the freight on a car of apples is $114,87 to $121.17, and on a car of flour $57, a difference of 100 per cent. to 125 per cent. on the barrel basis, and 135 per cent to 162½ per cent. on weight basis. Notice, please, when apples are plentiful, up go the freight rates, as in 1896, and when not so plentiful, rates are lower ; while this year grain and flour are plentiful, freights are lower on those commodities. While the rates I have mentioned apply to export trade, the same rule applies to local rates. Apples and fruits pay from 20 per cent. to 100 per cent. higher rate than flour. Now, having established the fact, I will give the replies of the carrying companies' officials. I put the question to an official high up in railroad circles, "Why should a barrel of apples pay more freight than a barrel of flour ? His reply was, "Because apples are perishable and require more attention than flour." Then I said to him, "supposing I were to ship a carload of apples and a carload of flour to go by a certain steamer to Liverpool or other port, and on arrival at seaboard it was found that the steamer could not take either of them, and there was only room in the shed for one carload, which would you put into the shed ? and he replied, "the flour." I said, "Pile the apples up on the wharf exposed to all kinds of weather ?" and he said, "Yes." "Why," I said, "I thought you charged a higher rate of freight on apples because they needed more care and attention, and yet do not give them the extra care and attention they pay for." He said, "Why, the weather, rain, etc. does not hurt apples, but if the flour were on the dock it would be spoiled." Gentlemen, was his logic right ? I will venture the assertion that treatment of this kind to our fruit has more to do with it landing in bad condition on the other side of the Atlantic than either bad packing or bad fruit. Another railroad official replying to this question said. "Who built the railroads of this country ? Who paid the bonuses ? For whom are the railroads operated ?" I do not know what he meant, nor could I get him to explain ; but he said, "Think over it;" and I would not like to assume what he did mean, but I think if the obligations the carrying companies are under to the municipalities and governments that gave them bonuses, grants and charters, were fully met, we would have very little reason to complain, as the railroad and steamship lines would be operated in the interests of the people, and not for the high-salaried officials and stockholders, and we would have a better equalization of freight rates. (Hear, hear and applause). Still another railroad official replying to the question said, "Because we can get it." (Laughter.) I think this reply about as near the truth as any ; and that led me to believe that there was only one way in which the freight rates on fruit could be remedied, and that would be by united action on the part of growers, shippers and handlers of fruit. You take millers

and grain dealers ; when they want to get special rates, or their freight rate lowered, they can do so by united action, and they bring that united action through their Boards of Trade or through other influences that are powerful. Well, why cannot the fruit interests of this country unite and bring pressure just as powerful as the men who are interested in other trades ? So long as the handlers and shippers of fruits stand apart as they do now it will always be as it is. A steamship official's reply was, "Apples being fruit and of a perishable nature, we are bound to charge higher râtes of freight" Then I asked him if any special stowage was generally given to apples, he replied no, but said "We generally make deck freight of them if possible because easier handled than general freight. We want to load and unload our deck the quickest." And still all this time we are paying a higher rate of freight to get care and attention. Another steamship official gave me about the same reply; but I asked him what special care they gave for the extra charge, and he said, "I cannot tell." Then I asked him why their freight rates fluctuated so much, and why rates were so much higher in 1896 than since that time, and he replied, "We always take advantage, if possible, when large quantities of perishables are moving, and make all we can out of the situation." I might divert somewhat from the subject just here, and call your attention to the apple crop of 1896. The year that so much money was lost by Canadian shippers. The crop was abnormal, freight rates were excessive and losses heavy, and after careful estimates by interested parties, it is believed that if the extra freight rates charged that year were put into the hands of the apple shippers of that year (some of whom have not recovered their losses yet) there would be sufficient to meet these losses, and instead of being bankrupt, some of them, they would have come out even or perhaps a little ahead.

I think I am perfectly safe in saying that, if apples had had the proper care and attention in transit that they are paid for, the losses to apple shippers would have been very considerably less. To illustrate what I mean I will give you a little personal experience. We contracted with a certain steamship line to carry a certain quantity of apples, so many barrels per week, and in order to carry out our part of the contract we shipped the quantity agreed on each week, and on one of the weeks the steamers could not carry all we sent down, and as the cars had to be unloaded the apples had to be piled up on the dock, and the apples sent the following week out on the steamers intended, but the apples on the wharf were not loaded for three weeks, apples shipped nearly two weeks after them being in Liverpool and sold before the ones left on the dock. Those that went right through either made a profit, or loss was very small, but the ones that were left on the dock so long did not realize the freight when they arrived at Liverpool, simply because of the condition, said bad condition being caused by extra care and attention in transit for which steamship charged high rates. I contend that if we had a quicker transportation, better care and attention while in transit there would be less complaint of bad Canadian apples, and personally I would not object to paying more freight on a barrel of apples than is paid on a barrel of flour if fruit got the extra care and attention necessary. Now we keep hearing the cry, "Only send your best apples to Great Britain"! and my experience has been that I can do better with my fruit at home. It is customary in England to unpack apples put into storage before shipping to England, making three grades of what was only one in the autumn, and my experience has been that eight times out of ten the second and third grade apples sell in England for more than the first grade. Why I cannot tell, and I have asked men who were handling these apples the explanation but could never get a satisfactory explanation. The only conclusion I can arrive at is, that as they sell the apples by weight, the second and third grade will weigh more than the first grade, and the men they send down to the dock to examine those packages heft them in some way or another, and they pay the most money because those fruits weigh the most. It also happens that the best apples suffer most in transit, and that those which are the best in quality and packed equally as well as the inferior ones are in the worst condition when they arrive at destination. Such would not be the case if proper care were given in transit. How can we accomplish the getting of freight rate on a more equal basis, and

also the proper care and attention while in transit? First, by united effort on the part of the shippers and handlers to secure the desired object—we must pay more attention to the packing and the handling of our fruit, and to getting the cost reduced of conveying it to the customer.

Mr. Rickard: I would like to ask why the Grand Trunk Co. charge 20 cents a hundred more for pears from Toronto to Montreal than they do for apples?

Mr. Dawson: I asked that question of one railway official, and he said "Why, pears are higher priced—(Laughter)—"Pears are heavier and more valuable." Well, I called his attention to the fact that we are paying more for apples than for pears, and then he could not give me any explanation at all.

Mr. Huggard, (Whitby): As a matter of fact an apple barrel will contain nearly 200 pounds of pears, but only 165 to 175 pounds of apples. I have repeatedly asked Grand Trunk officials why they charge more for transportation of pears than apples, and they said, those were the more valuable and consequently were entitled to a higher rate of charges.

Mr. Dawson: Those of you who are acquainted with the fruit trade of California will know that by united action they have accomplished a great deal in having their freight rates put on an equitable basis. They have their fruit shipped from the Pacific Coast to the Atlantic Coast at the same rate as any other commodity, and in fact at a smaller rate than a dry product of the same fruit.

Mr. Huggard: When I requested the Grand Trunk Railway to send pears in their refrigerator cars that were shipped from Hamilton they would not do so, and the consequence was, as I was obliged to send them to Montreal, they went through on the same express and were sold there. I would like to see this Association interview the Government or the Railway officials, or some one, in order that we may get equalized freight rates. It is perfectly ridiculous that people in Cobourg have to pay the same rate for a basket of fruit to Montreal that they do from Grimsby, nearly double the distance. The rates, either by express or by freight are so exorbitant, that it takes all the cream off the value of the fruit before it is landed at its destination.

Mr. McKinnon: There is a Committee on Transportation, and when their report comes out we can discuss the question.

Mr. Eben James: This is a very vital question, and while any shipper will endorse a great deal of what Mr. Dawson has said I think we must look at it from the steamship and railway standpoint for a moment. As it is to-day we get a rate say 73 cents from any point east of Toronto to Portland or Boston, and our apples are put on the fastest trains and get an express rate of 24 or 36 hours. We know very well that flour does not go on these trains. Our apples are put on the very fastest trains, and go along with meat from Chicago and so on. Were we to get the same rate as flour we should kick very much if our apples made no better time than flour, and there are dozens of vessels that take flour out of Montreal that we would not ship our apples on at all. When the Thompson line used to run here some years ago, and they took nothing but the coarse fruits, it was the exception for them to have a barrel of apples, because they had not the steamers accommodated to them, and while there is certainly a big difference, freight rates are like any other kind of exchange, and steamers will tell you that they are carrying freight at a loss, and they are going to withdraw some of their tonnage, and when there is only a small proportion of everything they will get as high a rate as they can. In the case of one of those fancy barrels of pears going astray the shipper makes a claim for $7 or $8 on the Railway Co., whereas a barrel of apples only costs $2 or $3.

AMATEUR ROSE GROWING.

By J. G. Jackson, Port Hope.

I wish it to be distinctly understood that this paper is based on my own experience in Port Hope, and does not apply to the north and northwest parts of the Province. Roses which bloom to perfection in this part of Onartio could not be recom-

mended, say, for Algoma, or any of the counties north of Simcoe.

The word "amateur" has a very broad meaning, and covers a very large territory. As a matter of fact, it is difficult to draw the dividing line between "amateur" and professional.

A person may be classed as an amateur who can barely distinguish a "Paul Neyron" from a Red Cabbage, or a "La France," from some of the beautiful pink peonies which adorn and beautify almost every garden in this Province. Or he may be one who has all the qualifications of a professional, yet does not come under that class, simply because he enters this field of floriculture for the gratification of pleasure, and not for a livelihood. Thus it will be necessary for each individual to give his or her own definition of this word.

In the preparation of this paper I have carefully striven to make it as practical as possible, and in order to do this it will be necessary to suppose a person who wishes to grow a few roses, but has little knowledge of this subject. It is altogether probable his first step would be to consult some of the catalogues issued by the various wholesale houses in this or the adjoining country (and which, I regret to say, are altogether too much exaggerated, consequently misleading). He very carefully goes over the list, first the "reds," second the "pinks," and, lastly, the "whites," then marks his choice according to the description given, and forwards his order to be shipped as soon as the frost is out of the ground. To the inexperienced this mode of procedure will be considered all right, and perhaps it is—I say "perhaps," advisedly—but as a matter of fact the most important points have been neglected. In due time the trees arrive, and what are they ? Roses, certainly. Are they one year or two year old plants ? Are they on their own roots, or on the Manetti stock ? Are they propagated and grown under glass, or are they field-grown These are some of the questions that are of vital importance, and yet, I venture to say, these very questions receive but little, if any, consideration at the hands of the prospective rose grower.

Let it be thoroughly understood that unless specific instructions be given when ordering, as to age of plants, budded stock. or otherwise, nurserymen will send what suits them best.

Another important matter, and one which should receive careful attention, is the planting, especially of low budded stock, which should be placed so that the point of contact (or, in other words, where the bud is inserted into the briar stock), should and must be placed at least four inches below the surface of the ground in order to secure the best results. Roses planted in this way will very soon become established on their own, as well as on the briar, root.

Then if we wish to bring the rose to its highest point of development there must be proper conditions. In the first place, a good clay ground is very necessary, and in the second, it is simply impossible to make it too rich. Well rotted manure from the cow stable applied in the fall or spring will be found to produce good results. Through the early summer months a liberal application of hardwood ashes will give a deeper green to the foliage, as well as harden the stems. If the above suggestions be properly carried out, and the ground kept free from weeds, and loose about the brushes, the grower will find a profusion of bloom as a reward for his labor.

A paper on this subject would be incomplete were it not to include a list of "Hybrid Perpetuals," as well as a few "Hybrid Teas." It is well known to every rose grower that there are some varieties that stand out prominently ahead of others, and should receive special recommendation. Of the "Hybrid Perpetuals" I will name half a dozen of each color that I prize as the best all-round roses in my collection :—"Charlés Lefebvre," "Earl of Dufferin," "Gen. Jack," "Madame Masson," "Jules Margotten," "Alfred Colomb," "Baron de Bonstettin," "Mrs. John Lang," "Baroness Rothschild," "La France," "Mrs. Geo. Dickson," "Paul Verdier," "Jennie Dickson." The whites are :—"Merville de Lyon," "Margaret Dickson," "White Baroness," "Marchioness of Londonderry," "Kaiserine Augusta Victoria," "Coquette des Blanches."

I would say to the prospective rose grower purchase all the above, but a selection can be made from this list that will, under ordinary circumstances, give good re-

sults. The above named varieties belong to the "Hybrid Perpetuals" (so called). To those of limited experience I will just say the word "perpetual" is somewhat misleading. It does not mean that this class of rose will bloom all through the summer. They produce one crop of flowers in June and July, and occasionally in autumn, but are not perpetual bloomers, as the name would indicate.

For bedding purposes the "Hybrid Teas" will give a fairly continuous supply of bloom, and are perhaps the most satisfactory roses grown.

It seems impossible to separate advantages from disadvantages ; in fact they appear to be inseparably connected. While we have the everblooming quality of the "Hybrid Teas,' they have not the stout, strong, hardy nature of the "Hybrid Perpetuals" However, this need not deter anyone from including a few of these in his collection. If properly covered and kept dry through the winter months they will open up all right in the spring.

Next variety in order is the "Tea Rose," still more beautiful, yet more delicate and tender, and more particularly suitable for forcing ; although if bedded out during the end of May it is possible to secure a few choice blossoms during summer. Although the size of the latter variety does not equal either of the former, yet it possesses a beauty which is simply beyond description.

Pruning.

With regard to this matter I know there is a diversity of opinion. Some prefer fall as the proper time, others again claim the spring as the best time ; personally I like to wait and see how much pruning 10 to 15 degrees below zero has done for me. It is a light task, if found necessary, in the spring. Experience has taught me that there are some roses which require more pruning than others ; for instance, "Margaret Dickson" (a strong, vigorous grower), will not produce bloom if severely cut back. Then there is another class that will not bloom unless severely pruned. Thus it will be seen that if we want the best results we must study the individual nature of each rose, which varies to the same extent as does human nature. It is in this regard that we recognize the hand of the Creator. There is not a tint that paints the rose, nor decks the lily fair, but speaks out most conclusively, at least to my mind, that God is everywhere.

Has not the artist exhausted his skill in trying to reproduce this—the "Queen of flowers" ? The poet has endeavored for centuries to sing its praises; yet both have failed to do justice to this lovely flower. We inhale its fragrance. we gaze on its profusion of color, from the pure white to the deepest crimson. We examine its every part, and the more we study the deeper becomes the mystery. But as the finite cannot grasp the workings of the infinite, we are forced to exclaim, "The hand that made it is divine !" If time would permit we could show how the study of floriculture broadens and develops our social and moral nature. I know of no study that will assist us to reach those heights of true manhood and pure womanhood like that of floriculture. How necessary, then. that we should strive to inculcate into the minds of others, more especially those of the young, whose minds are sensitive, the necessity of grasping those subjects which will keep the mind pure and unspotted. If we, as members representing the various Horticultural Societies of this Province, would use every effort to have this subject grafted thoroughly into the young minds, we shall accomplish something at least that will in after years bring forth fruit to the honor of, not only the Association in particular, but to the Dominion in general.

Mr. Whitney : I think a discussion of the rose for amateurs would be incomplete without speaking of the insect enemies of the rose.

Mr. Jackson : There is no doubt that the insects are a tremendous pest to rose growers. I think I have hit upon a solution that destroys them. Take whale-oil soap, make a strong solution of it, and get the extract of tobacco, buying it in pint bottles. Use that in about 20 parts of whale-oil soap to one part of the extract of tobacco, and apply it with an atomizer, such as the Evans of Hamilton, and you will get rid of

your pests. I tried kerosene emulsion in the first place, but found it very difficult to make an emulsion that would not be injurious to the foliage.

Mr. Whyte: How much water do you use with that?

Mr. Jackson: If you take a pint of whale-oil soap to about three or four gallons of water you will have a fairly good proportion. Then, of course, this is for the aphis, or the insects that suck. You must understand that there are two pests which interfere with the rose growing; the first is the insect that sucks, the next is the insect that eats. There must be two remedies, one that will suffocate or choke the breathing pores of the insect, and the other that will destroy it, that will go into its stomach.

Prof. Saunders: What do you mean by the extract of tobacco?

Mr. Jackson: Fluid extract of tobacco. Any nurseryman will supply it in pint or half-pint bottles. Three or four gallons of water to a pint of soap, and then add your tobacco in those quantities.

Prof. Saunders: Have you tried the Madame Joly rose, one of the Hybrid Perpetuals? We have found that particularly valuable at Ottawa. We planted three of those plants in that very dry climate eight or nine years ago, and there are still three healthy plants living, and we cannot say that of any other variety we have tested. It is a very free bloomer. I would like to ask what winter protection you give your roses?

Mr. Jackson: So far as the hybrid perpetuals are concerned, I give them but very little, with the exception of banking up around the roots, and to do that in the first place I get good rotted manure in the fall of the year and then I gather up all the leaves, maple leaves in particular, and throw them around them. So far as the top is concerned, I do nothing with them. Hybrid teas will be better for a little thatch. The tea roses I protect with a nail case, and knock out top and bottom, and just form the cases, then I insert a stick right through the centre of the bush and bind the bush to the stick. The stick stands out of the top of the barrel from 8 to 19 inches. That forms a centre pole just as in a military tent; then I take a piece of canvas, or anything of that kind, and spread it all around the barrel, putting in a few dry leaves in the barrel first. In that way I think you will get all the protection that is necessary. I think there is a mistaken idea among people in regard to the rose being killed by frost. If roses that are covered up slightly are allowed to remain until all appearance of frost is gone you will get away with that trouble. I have known scores of beautiful roses destroyed simply because they were uncovered too early in the spring. It is not the extreme frost in the winter that kills the rose so much as freezing and thawing in the spring of the year.

Prof. Saunders: I think if Mr. Jackson would come down and live with me at Ottawa for three or four years he would find this question of protection a very serious matter. We have never been able to carry the tea roses through the winter, and the hybrid teas are killed out and the hybrid perpetuals are killed out continually in Manitoba and the Territories. We have not found a hybrid perpetual or a hybrid tea rose that has been able to live more than two seasons in either of those localities. We have tried a covering with earth and a covering with leaves; and as far as the cover goes the rose is usually protected, but the parts that are above that covering with earth and leaves are usually killed back. We find it best also to do our pruning in the spring when we see what the result of the winter is; but last winter I tried an experiment which pleased me very much in its results. It was not original with me; I got the idea from another rose grower in Ottawa. We took some plank 16 feet long and 1 foot wide, and nailed the pieces together, making ends, and set that down; that would cover a space of six or eight roses; then nails were driven about 4 inches below the top, pointing downwards inside, so that we could point the canes down inside and catch them in those nails. Then the boxes were filled up loosely with dry leaves, and we had the most magnificent show of roses this last year that we ever had in Ottawa, mainly on the bushes so protected. I am trying it again this year, varying the material, using spruce in some and leaves in others, and in other cases without any covering at all, using the still air as a non-conductor. I think the protection of those valued plants during the winter is one of the most important questions to the growers. It is very

disappointing when you get a bed of roses to find in the spring that they have all been winter-killed.

Mr. Jackson : In regard to tea roses I suppose they are the most disappointing roses that are grown. I have just about fifteen that I have wintered out for five years in my garden, and they have been magnificent with me, and all that I have done with them is just as indicated with the barrel, place a few dry leaves around it and form a cover at the top that will keep thoroughly dry. With regard to the hybrid perpetuals, if I was going to cover them at all I would merely take a stake, fasten the bush to the stake and lay a little rye straw, because it is longer than wheat or oats, and take three or four cords, and bind it round to make a thatch. That will keep it dry ; it will shed the water, and if you do that with your hybrid perpetuals I think you will find it will stand as far north as Ottawa. Mr. Race of Mitchell, has lived farther north than myself. I am merely giving you what I have presented after 25 years' of experience.

Mr. Race : Mr. Jackson was rather in error. He said I lived farther north than Port Hope. Our meridian line at Mitchell is somewhat south of Port Hope, although I am farther west than this. I know the conditions at both places and the soil and all the atmospheric difficulties, and I am rather surprised at the list that our friend has given us here. My object in presenting this subject before the public is to encourage the growth of roses, and I always make it as easy as possible, and avoid as far as I can any difficulties or disappointments. If you want to start a person growing roses you want to be sure that you have given them a selection of roses that will grow easily and bloom well, and a rose that will not be very much trouble in its cultivation. If you do that they will have such a return as to give them pleasure, and then they will go on to further experiment ; but if you give them a list of roses that are delicate, and that will only throw you out perhaps two or three blooms, no matter how much time is spent upon it, they become discouraged, and then their cultivation of the rose is very short. I realize that Mr. Jackson is now just where I was a few years ago ; he is just as enthusiastic as I was—I used to call myself the rose crank—there are a number of those roses that he has mentioned now that are only fit for cranks—(laughter)—because a crank in the rose line would buy a rose, care for it and cultivate it all through the seasons, for the sake of a couple of very beautiful perfect blooms; but you do not want to recommend such a rose to everybody, because they would not be satisfied with it. Take Margaret Dickson, a beautiful, charming rose; I would never recommend that to any person starting in the rose line, because I never think of protecting my roses during the winter without covering every one of them. I have some four or five hundred bushes, and you will see it is quite a task to cover all those roses, yet I find it necessary even up there, although our climate is not as severe as it is in Port Hope. I cover them with maple leaves and bend them down. I never think of pruning a rose in the fall ; leave the branches the full length, and my roses grow 9 or 10 or 12 feet high. I keep my ground immensely rich, and they are very easy then to bend down, and I cover them with straw or maple leaves. As to my method of protecting them from insects, last year the Hon. Mr. Dryden came into my lawn just before the blooming season, and he was surprised to see my foliage looking so clean and fresh, and he asked me what I had done to get this effect, and I said, "I have done nothing," and he said, "Surely you do not mean to say that you have given them no treatment ?" I replied, "I have really done nothing up to this time." He replied that he had never seen foliage in a rose plot at that season looking so fresh as mine was. I said, "I get my ground so strong that it is almost able to fight against the ravages of the insects," although that is not a good principle to act upon always, and the only thing that I ever have to do with the roses in later years is just to give them a slight sprinkling with the Paris green water. I like to make the treatment just as simple as I can, so that the amateur will not find difficulty and think there is too much trouble with the rose. Just as soon as you see the slug coming on—because that is really the most troublesome of all, it spoils the foliage, and a rose plant with the foliage spoiled is spoiled altogether, for there is as much beauty in the foliage as in the bloom—give them a slight spraying of Paris green water. There is also that little worm or caterpillar that eats into the bud

that comes on about the same time; the Paris green water will treat that. As for the little thrip that gets in earlier under the leaf, I merely use common soap suds. This treatment, recommended by Mr. Jackson, is very good if you wish to go to that expense, but just take common suds and spray underneath it with a good deal of force and you will dash them all off, and by two or three sprayings of that kind you will get them clean of thrip.

Mayor Huycke: I wish to ask, on behalf of a lady, what kind of Rambler Roses are profitable varieties?

Mr. Race: There is beauty in the full Rambler, but the trouble is there is no fragrance to a Rambler Rose. Queen of the Prairies is a beautiful rose, but it has no fragrance at all, and it is very much subject to that little thrip, and it requires a good deal of attention by spraying, and I use soap suds only on that. You have to force the suds on the end part of the leaf. That is about the only rose that I would recommend as a full climber, but the semi-climber is a very much more satisfactory rose. If you want a half climber take Victor Verdier. The Victor Verdier is a magnificent bloomer, and it is a preferable rose to its parent Victor Verdier hybrid, because it has some fragrance. The bloom is a nice pink, just about as near the rose color as you can get it. These are the only two climbing roses that I would recommend.

Prof. Saunders: What about the Crimson Rambler?

Mr. Race: There is a family of Ramblers—the Crimson, the White, the Pink and the Yellow. Of these the Crimson is the choicest. It is a good, strong grower. It requires to be laid down in good time. It is very easily laid down and very easily brought through with just a little covering, and it grows so rank it throws out a very heavy bloom. Of course the blooms are not very large, but they grow in such thick and heavy clusters that from a distance it is most magnificent, but not so pretty when you get close to it. Among these Ramblers the Crimson is the most beautiful. If you want a second one you better take the Pink, although the flower is still smaller, but the White and the Yellow are really not satisfactory with us.

Mr. Beall: You do not mention the Baltimore Belle?

Mr. Race: The Baltimore Belle is a climbing rose, and I used to have some seven or eight of them. Some years ago I threw it into the wood pile, and have not one about my place now. It belongs to the cranks now. I would rather have something where I would get much more satisfactory bloom. Do you prize it?

Mr. Beall: I do prize it very highly. I find no difficulty in getting as many blooms as we should expect on a rose, and we find the branches will grow perhaps ten or twelve feet in a year, and we get hundreds of roses off a bush. We have several of them, and they all do well.

Mr. Race: I can get lots of bloom from the Baltimore Belle.

Mr. Beall: Certainly there is no prettier rose, and the perfume is all you can desire.

Mr. Race: It is a very nice rose for those who like it. I prefer the semi-climbers.

ORGANIZED EFFORT IN THE FRUIT EXHIBIT FOR THE LOUISIANA PURCHASE EXPOSITION AT ST. LOUIS, 1903.

By Harold Jones, Maitland.

Now is the time when we, as an Association, should make the necessary arrangements to have a telling and effective display of fruit at St. Louis in 1903.

What we need is organized effort to gather the very best our Province can produce, and this cannot be done by any one man alone without co-workers and systematic effort.

In our recent experience at Buffalo we find that, although all credit is due to our friend Mr. Bunting for his untiring and energetic work, he was handicapped from lack of system, and had to depend largely upon receipts of fruit in a haphazard and uncertain way.

When visiting our fruit exhibit at Buffalo after leaving the Industrial at Toronto, I was struck by the inferior quality of many samples on the tables; they could not compare with what I had just left at Toronto, particularly in apples. There were such poor samples in some varieties that I asked Mr. Bunting why he put them on the tables at all, and he said, "What can I do? This fruit comes to me, and if I do not put it up probably in a day or two some one will come along, and, looking around, will ask, 'Where are So and So's apples, you know he sent some?' and if I told him they were not good enough to show he would go home mad, and probably noise it abroad through his neighborhood, and I would receive no more fruit from that section."

Now in exhibiting and competing against the American continent we cannot afford to show anything but our very best. We can grow the finest of fruits, but we have close competitors, and cider apples will cut no figure in the race.

Now we have not got the time at our disposal at this meeting to take the matter up in detail, but I will ask the meeting to give it a short time for discussion, and appoint a committee to go thoroughly into the matter and have everything in readiness when the time comes for collecting the fruit.

I feel sure our Government will aid us in the comparatively small funds necessary for the work, and it can do so feeling assured that our Association will do the work well and make it a credit to our Province and country, and knowing that the exhibition with a Federal grant of $15,000,000 will probably be the largest ever held in the world, and will attract visitors from all quarters of the globe.

Now in appointing your committee suggest to them that they select men for the work from those sections where special fruits grow to special excellence—men who are themselves good judges of special varieties, and whose duty it will be to collect the samples and properly pack them and forward direct.

In that way the Superintendent at the Exhibition will know just to who he is to look to for his fruit, and can regulate the quantity coming in, and if not up to the standard, or with any other faults, he can write plainly on the subject without fear of hurting anyone's feelings. I hope that you will spare time for discussion on this subject, so that we can get the views of the many practical fruit growers here to-day.

SOME NOTES ON SPRAYING.

By J. E. Orr, Fruitland.

One would suppose that the subject of spraying had been thoroughly threshed out and its utility so amply demonstrated from such a sound and logical basis that we might almost allow the matter to rest, feeling assured that every one who attempts to grow fruit would recognize its advantages and incorporate them into their system of orcharding.

The Department of Agriculture has been put to much pains and expense to demonstrate the advantages and encourage the practice of spraying, but still there are many to be found who do not believe in it, who are indifferent to it, or who do it in a half-hearted way.

Some years ago I had addressed a farmers' institute meeting about ten miles from Cobourg, and was saying good-bye to the local clergyman. He said, "Good-bye, Mr. Orr. I suppose now that you have told the people how to attend to their orchards properly they will go right on and do it in the same old way." My reply was, "Yes, sir, just as they do when you preach to them." We find it necessary to have the clergy address us fifty-two times a year on spiritual matters, which we all allow to be of supreme importance, and still many do not accept the teachings of Christianity. And it would appear in temporal things that it is also necessary to have new theories and new ideas frequently and persistently presented to secure their general adoption. Institute

and horticultural speakers must expect that some of the seed will fall by the wayside, some on stony ground and some among thorns, and be satisfied if, occasionally, they can drop some seed into good ground.

Spraying is only one of many ways of protecting plants from the ravages of insects and fungi. The reason why it recommends itself to us is because it is the easiest, most effective and also the cheapest method. It is not a panacea for all the ills that plants are heir to, neither is any one formula applicable for all purposes. It is not necessary to go into the A, B, C of spraying at a meeting of this Association, and I only wish to call attention to a few of the principal causes of failure to obtain results.

In the first place, it is necessary that the remedies should be applied intelligently; that the orchardist should be able to diagnose the disease. A doctor who prescribes for a patient without this knowledge is called a quack. There are lots of quack tree doctors. There are some who, after having seen a few demonstrations of spraying, imagine that they are authorities upon the subject, and able to teach it to others. We find it very different after sixteen or seventeen years of practical experience. I find there is much about it that is not quite understood. As Prof. Roberts very aptly puts it, "You must examine the sickly plant, question it, ask it, 'What's the matter with you, anyway ? Are you sick ? Are you hungry ? Are you thirsty ? Are you lousy, and what kind of lice have you got ?' And when you have received a reply, you will then be in a position to apply a remedy in an intelligent manner. Here is where many people fail at the outset. Some have found a formula unsuited for the purpose for which they applied it, and have rejected it for all purposes. Thus I have found people who tabooed the practice of spraying because they had tried Paris green on aphidae, of course without result, proving Pope's contention, 'A little learning is a dangerous thing.'"

Again, many do not spray the trees at all, but simply drench them, in which case the particles of fungicide which are suspended in the water are mostly flushed off the leaf. If you will examine a plant which has been treated in this manner, after it has dried, you will find the larger portion of the leaf clean, and just at its point, where the drip has been, quite a deposit of the particles. To secure results, it is absolutely necessary that the mixture be applied in such a fine spray that it will rest upon the plant as dew. If the application is carried beyond this point, not only is the excess of material wasted, but it seriously discounts the value of the whole operation.

Again, many fail to secure the maximum results by not applying the remedies at the proper time. No dates can be given, as the seasons vary so widely. The calendar in common use, and the one we have always adopted with success with the Bordeaux mixture is :—

1st spraying, when the buds are swelling.
2nd spraying, just before the blossoms open.
3rd spraying, just after the blossoms have fallen.

Subsequent sprayings at intervals of from 10 to 12 days, if found necessary. By this I mean that a close watch should be kept on the fruit and foliage, and upon the first appearance of those olive-green spots, which are the first indication of the growth of the scab, or if any insect is making headway, we would apply the extra application. Here again is where the faculty of observation comes into play. Major-General Baden-Powell says in his little book "Aids to Scouting," "One pair of trained eyes are worth a dozen pairs of untrained eyes." And it is as true of the fruit grower as it is of the scout. He must be an observer. You may have noticed an article, recently published, by Prof. T. J. Burrill of the Department of Agriculture of the University of Illinois, who has announced that the parasitic fungus, usually called apple scab, does not winter as supposed on the twigs of the tree, and, therefore, cannot be killed by spraying before the buds open. This is deemed a very important matter in practical orchard management, for sucess hinges upon its destruction and is dependent on a knowledge of its life history. For best results the first application of the fungicide (usually Bordeaux mixture) should be made just after the buds open."

If this be correct, our first application has been somewhat too early. We shall watch further results with much interest.

One of the most prolific causes of failure is probably in the preparation of the Bordeaux mixture itself. Just what chemical and mass action takes place in the spray barrel is indeed a vexed question. Some have advanced the idea that the lime is added to neutralize the corrosive effect of any free sulphuric acid. If this were the case, we should have a soluble copper salts and a precipitate of lime. But such is not the case. I have seen Bordeaux mixture, to which an excess of lime had been added, where almost every particle of the copper salts had been thrown down in a very coarse precipitate, and, when the clear fluid was tested with ammonia, it would give a scarcely perceptible tinge of blue. It would, however, give a strong reaction when tested for sulphate of lime. Of course, this clear fluid was of no value as a fungicide, the beneficial properties all being in the sediment. Even in the solution properly made a reaction takes place which probably gives cupric hydrate and sulphate of lime, but in an exceedingly fine form.

Many people complain that their mixture is "curdy" and, in some cases, they can hardly work it through the pump. In such cases I have always found that they were in the habit of using an excess of lime and of bringing together the concentrated solutions and afterwards filling the barrel with water, instead of adding them one at a time to the barrel of water. Why this should make a difference I will leave for you to investigate, but it is a fact that by mixing the concentrated solutions you get a heavy, coarse precipitate, which it is almost impossible to keep in suspension and which is difficult to work, while, by bringing them together in a very diluted form it will precipitate very slowly, and have the appearance of a homogeneous mass.

If you wish to see an illustration of just what takes place when the concentrated solutions are mixed, bring together a small quantity in a wine glass. In less than a minute it will form so solid a mass that you can turn the glass upside down without spilling any.

It is well to have the copper sulphate and lime properly balanced. Bring each barrel just to the point where the ferrocyanide of potassium test will not reach and, if you have mixed it as directed, you will have a mixture which you can handle without difficulty and which will act quickly.

Some claim that in continued wet weather Bordeaux mixture so evenly balanced breaks down too quickly and burns the foliage; they think it better to add more lime as an equation of safety. However, we have never found this difficulty and prefer the mixture to be just balanced.

Mr. Caston: Have you or anybody else succeeded in getting Flemish Beauty pears absolutely clean?

Mr. Orr: I think we have, and Mr. E. D. Smith will tell you that we have about as nice Flemish Beauty pears as he ever saw.

Mr. E. D. Smith: Yes, that is right.

Mr. Tweddle: Yes, that is right. I live next door to them, and I see them every day.

Mr. Sherrington: Flemish Beauty pears were clean this year without spraying.

Mr. Whitney: Did you ever use bi-carbonate of soda instead of lime?

Mr. Orr: No, sir.

Mr. Whitney: A very successful fruit grower in my vicinity does.

Mr. Shepherd: Does Mr. Caston say it is impossible to keep Fameuse apples clean?

Mr. Caston: I did not say it was impossible. I said I had not succeeded in getting them entirely clean.

Mr. Shepherd: Keep on spraying.

Mr. Caston: I have done it for a good many years.

Mr. Shepherd: I have seen wonderful effects on the Lower Lachine road, where I buy the right to pick up apples. There is one orchard divided by a cedar hedge in the middle, and that man had about 50 Fameuse trees in his orchard about 20 years of

-age, just in their prime. He had sprayed the first half all right, but he had not sprayed beyond the hedge, and when my pickers were there they could not pick one case when they got beyond the hedge; they had packed 150 cases in the first part.

Mr. Caston: One thing that has a great effect is the location of the ground where the trees stand. If you get trees well trained and open to the circulation of air and on rolling ground, and take others on flat land where there is not a free circulation of air, there is a vast difference, apart from the question of spraying altogether. I would not say one word against spraying. I would say to everybody spray and keep at it persistently; but I say I have not been able to keep them entirely clean. In some seasons we have the Flemish Beauty fairly clean, but in others we cannot get them clean by spraying in this way. I find where the ferro cyanide had been kept for a year in a closely corked bottle I could not get enough lime to prevent it still showing color when added to the mixture; a person might be led astray in that way as to the strength of the mixture. The bulletins that are issued by the United States Department, as well as those in this country, say, "Use the ferro cyanide test, and then when that shows it to be right, it is perfectly safe to use it on the foliage of plums and everything else, but add a little more lime to have it perfectly safe."

Mr. McNeill: Have you found spraying a perfectly satisfactory remedy for plum rot?

Mr. Orr: I would not say perfectly satisfactory. I think it has reduced it in some places very largely.

Mr. McNeill: I have here the names of Mr. Berton Mavor, Mr. Sutherland and Dr. Haanel of Collingwood, and two or three others here, large plum growers, who tell me that they have sprayed persistently this year, and have scarcely been able to see the results of their labors. I think probably your explanation will be quite appropriate here. I have no idea that we must give up spraying, but it does not appear that the practical plum-growers are finding it altogether satisfactory.

Mr. Orr: We grow a great many plums. Of course we cannot control it entirely, still we have found that our orchards are a great deal better than those of our neighbors who do not spray. Of course as a protection against that, all the mummies are removed in the fall from the trees. Prof. Hutt suggests that I should show you these two mixtures. They were both shaken up a few minutes ago, and you will see how the one has precipitated, and how the other has held up. These were mixed on Monday.

Mr. Tweddle: I live next to Mr. Orr, and pass his Flemish Beauty pears right on the front by the road nearly every day, and I must say that they were perfectly free from scab, all of proper size and perfect in every way. His trees are on red clay, rolling to the front. I only have two or three trees at the back, at the foot of the mountain on the washed soil, where we have more difficulty with plum rot, and we had no scab in that location; and I am perfectly satisfied from experience that if we get the Bordeaux mixture on properly, as Mr. Orr has said, that all the other conditions will yield to it, and we will get the result.

The Secretary: It is only fair to say that as far as I know the Flemish Beauty trees in that section that were not sprayed were totally unfit for market. I have a great many of them on my fruit farm, and those that were not sprayed were totally worthless this year.

Prof. Hutt: I think that this is a very important thing Mr. Orr has brought out, the difference in those two mixtures. I have met many fruit-growers throughout the Province this summer who had this same difficulty in making their mixture. They make the mistake in bringing together the two substances; if they had brought them together in diluted form they would have got their Bordeaux mixture to stand it, as shown in these bottles. I remember a few years ago at one of our annual meetings our President, Mr. Orr, declared he could not keep his Flemish Beauty pears free from scab, but those were the days when they had not spraying down to the science that they have it at present. I am glad now to know that he has had success, and is now one of the strongest advocates we have of spraying. I believe he is a strong convert to spray-

ing, and I know at first he was the other way, quite opposed to it, or at least said he had not got the results from it. I believe Mr. Caston will find that where spraying is followed up persistently the cumulative results will come out in time. You cannot do the whole thing in one season, but the results are cumulative. You get them fairly cleaned one year, and you keep right on, and the men who are spraying persistently get the best results.

The President: Every one who knows the Flemish Beauty tree knows that it has a beautiful green foliage. That is all that saved our trees from being cut down, for a good many years. We were not getting one specimen off them that was fit to send to market, and we were getting discouraged, and now we have no trouble whatever. We have had beautiful crops on these trees for the last four or five years.

Mr. Jones: How many sprayings do you give ?

The President: I think they were sprayed three times this season.

Mr. Caston: What is the most important one ?

The President: I cannot tell you that. If there is any sign of spots appearing on the foliage or on the fruit spray at once. If you do not see it there is no need of it.

Mr. Caston: The entomologist quoted by Mr. Orr from the "Horticulturist" says that the spores of this disease do not live on the trees, therefore there is no need of spraying on the tree. Where do they live ?

Prof. Saunders: I think that is one of the few things that we do not know yet.

M. Pettit: There is another point that has not been brought out in regard to Mr. Orr's Flemish Beauty pears being so clean. I was up there visiting his place this year and while my pears, which had been fairly well sprayed, were almost a total failure, I found that his were clean, but his trees had been very thoroughly pruned, thinned out very much, much more so than the pear trees that you usually see in any orchard, and I think that that had a great deal to do with it as well.

Mr. Whitney: Do you spray twice before the bloom ?

Mr. Orr: Yes, we have been in the practice of spraying just before the blossoms open, for the second time; the first time, any time prior to the buds bursting.

Mr. Caston: Would you recommend using the full Bordeaux mixture on the trees just before the buds are going to swell, or would you recommend the formula of two pounds to the forty gallons, or double that and make it four pounds to the forty gallons on the bare tree, without the lime ?

Mr. Orr: We always use the lime with it. It will adhere to the tree apparently very much better when you put lime with it. When it goes on to the tree in the form of sulphate of copper it is soluble, and will brush off very easily; in the other case it will stick on.

Mr. Tweddle: Another wonderful result Mr. Orr reached was in cherries. Nearly every one rotted down in our district. Mr. Orr tells us he sprayed twice, and I could not see a single rotten cherry on all his trees. He sent them over to the Pan-American and swept everything clean.

Mr. Jones: In regard to the Snow apples, I find no more difficulty this year than usual in keeping the spot off that variety, and if anything it was worse than usual in our section in orchards that were not sprayed. This year, on account of the wet weather and the difficulty in getting into the orchards, I only gave four sprayings, where I usually give six. The orchard is very much sheltered by a heavy avenue of maples, and the trees have been planted 20 or 21 years, and they are only 25 feet apart, so that they are almost touching in the row, and still with only four sprayings I had between eighty and ninety per cent. of apples entirely free from spot, and they classed nearly eighty per cent. first-class when they were placed in the barrel; so that shows it is not necessary to get on the top of the hill or have your trees very far apart, or open to the fresh air to get the clean fruit.

Mr. Tweddle: I had one instance this year where I sprayed an orchard which had been spraying two years. The gentleman had another orchard on his place about 40 rods from it with the same varieties on it, Spys, and while the Spys in the sprayed orchard packed about 75 per cent. clean of everything, over in his own orchard we did

not pack anything at all. I bought his orchard, but could not get any No. 1 Spys. They were all scabby.

A Delegate : I would like to ask what variety of cherries those were, sweet or sour ?

Mr. Orr : Both sweet and sour. The sour cherries that were sent were Early Richmond and Montmorency, and the sweet cherries the Governor Wood, Windsor, Black Tartarian, Alexander, Cleveland and some other varieties.

Mr. Bunting : I want to say, in corroboration of what Mr. Tweddle has said in reference to the President's cherries, that while we all know the extreme scarcity of cherries in our district this year, so that it was almost impossible to secure specimens for exhibition in Buffalo, the samples that came from Mr. Orr's farm almost daily were without exception the finest samples, I think, I ever saw, and I do not think we found one decayed specimen at any time while they were at Buffalo, and they remained in an excellent condition for quite a length of time. I think the same thing would apply to the specimens that were received from him during the summer.

Prof. Macoun : We should not under-value this discovery of Prof. Burrill. There is no doubt that the greater number of sprayings we can give the trees while they are growing the better, and by his discovery we find it is not necessary to spray while the trees are dormant, so we can give the first spraying just as the leaves are beginning to develop. In this way we can perhaps get in one more spraying, because that comes at an earlier season of the year, and we can get in the second spraying earlier ; but the point I wanted to ask was this, that we do not know when we may be troubled with the infestation of the tent caterpillar and the forest caterpillar again. I have found at the Experimental Farm that these caterpillars hatched just as the leaf buds are breaking, and the leaf buds expand from the 28th April to the 1st May.

The President : We have the dates at home, and it is the 8th to the 28th April.

Prof. Macoun : There should not be any special time—just when the buds are breaking, but if you can do it within a week or so of the time that the caterpillars hatch, you know when they are quarter or half grown they are much more difficult to fight. We find that by spraying just when they are hatching we clean them all out; and by regulating your first spraying so that you can do it justice by that time, I think you will find no difficulty with the caterpillars. You must use Paris green with all your sprayings.

ELECTION OF OFFICERS.

The election of officers was then proceeded with, and much interest was evinced in the result of the polling. The report of the Nominating Committee was finally amended by the substitution of the name of Mr. Snelgrove for that of Mr. Rickard as Director for District No. 5. The list of officers is given at the beginning of this report.

HORTICULTURAL SOCIETIES ; THEIR RELATION TO THE HOME, SCHOOL AND PROVINCE.

By G. C. Creelman, Superintendent of Farmers' Institutes, Toronto.

The subject assigned me is one in which I am intensely interested—the subject of horticulture in its broadest sense, as it affects our home, our schools and our country. We have in the Province of Ontario farmers' Institutes controlled by local officers in every district. Up to a year ago we had growing up in our farmers' institute meetings a tendency, especially among the young people, to want what they called better entertainment at the evening meetings. We found a growing demand for public speakers ; we found we had to have special attractions at our meetings in order to keep the young people quiet and bring them out to our meetings in the first place, and in some instances they even introduced such things as the Kickapoo Indians as a special attraction at the evening meetings for those who craved that sort of thing. I found,

on the other hand, that it was very hard to get practical farmers to address institute meetings in the evenings; that men who were entirely suitable for the evening meetings found it hard to be sandwiched in between the Kickapoo Indians and the comic singer ; and that when the most practical farmer got up to give a talk on the commercial fertilizers, or strawberries, or even floriculture, the young people simply bore with him until he got through, and it was discrediting some of our institute work. Down in the Township of Saltfleet, in the Hamilton and Grimsby district, that has been celebrated for so many things, we found that the women on the farms had begun to realize that they were a factor in the development of home life on the farm, and they made a demand that they have some women's institutes, and in Saltfleet Township was established the first Woman's Institute. (Applause.) Now, I saw that that would be a practical scheme to help out the evening meetings in the farmers' institute and do away with this special entertainment, and by encouraging the women of the different counties of the Province we have now 35 active women's institutes in Ontario, with an attendance during the past year of over 6,000 and an active membership of 1602 women. At these meetings they are discussing floricultural subjects, horticultural subjects generally, bee keeping, the production of poultry, dairying subjects, home dairying, particularly how to improve the quality of our butter in our home dairy, and the troubles and trials they are having in their own home. They find out that one woman in the country has a particular reputation for making a special quality of butter, and they get that lady to invite them to hold their meeting in her dairy, and they find out how much salt she puts in her butter, and how she has been getting a cent or two a pound for her butter more than other people do. So we found that many who came to these meetings to scoff remained to pray, and a great deal of good has been done for the farm home by the women's institutes.

In life the useful and the beautiful seem to stand in opposite relation to one another. The first thought of a man in his life work is utility ; later on he adds to this the beautiful. Elias Howe, a poor old cripple, sits watching his wife trying to make a scanty living with her needle, and as he sees her work his one thought is, "How can I ease her burdens ?" In his brain is finally evolved a sewing machine. The useful being uppermost in his thoughts, his first machine was rough and crude ; no thought of the beautiful filled his mind, but only the thought of the useful. It afterwards entered the minds of men to make the machine more beautiful, and now we have them in all shapes and sizes and encased in cabinets, boxes and desks. Robert Fulton had not our beautiful palace steamboat in his mind when he built his steamboat on the Hudson ; his only thought was to make a craft that would run against weather and tide, and his rude, cumbersome, awkward, yet useful boat, would not now be recognized alongside of our modern vessels. In the realm of thought and knowledge the useful is the first and afterwards beauty is added, and beauty and knowledge then go hand in hand, and as the nation increases in knowledge and learning you see her people increase with the useful and the beautiful, and utility plus beauty becomes one of the facts which determine in our minds "the civilization of a people."

Take the history of our own people : at first we had the rude log houses and cabins, built by our forefathers with the idea of usefulness. As they grow old and another generation succeeded them the thought of the beautiful entered with the useful and we find some of them building anew, while at the same time others could not get the idea of the beautiful in their minds, and moved their location farther back into the woods where they required only to think of the useful. Our forefathers had to work too hard with the axe and the plow to think much of how things looked. Now, the axe and the ploughs must be painted and made attractive before the farmer will think of taking them from the shop.

The fishermen on the sea of Galilee fished with home-made nets and lines, while to-day the sportsman goes forth with his silver mounted rod and artificial fly. Our fathers cut down the trees of the forest without thought of their beauty or their effect on the appearance of the landscape. To-day we are planting trees for the sole purpose of beautifying our home surroundings.

The Home. This brings me naturally to the first part of my subject "The Relation of Horticulture to the Home." In the matter of houses we find again a tendency in our older people to stick to the abode of their childhood, and to my mind there is not a more pitiful sight than to see an old couple on the farm, move from the house in which they have spent their happiest days, into the well-earned, commodious, brick ersidence which they have erected. Though they have now suites of rooms on two floors, a large, well-furnished parlor and sitting room, you will find too often that from long habit they content themselves with spending the last days of their life in the kitchen and bed room attached, leaving the rest of the house closed up, to be opened only when the minister calls or friends from the city come to spend the night. They have been used to an outdoor life, simply coming into the house to eat and sleep, and for these purposes, few rooms were required.

In the city we find the other extreme. Land sells at so much per foot frontage and the house covers most of the lot. The house is therefore home and farm to the city people, and it is made as large as their means will allow. You who are here tonight, however, will note changes taking place in both the afore mentioned. The country home is being made more attractive in the new houses which are being built; the kitchens are more convenient; ranges and furnaces are replacing the stoves, and in many cases bath-rooms are being provided for in the plans. Many of our farmers now reserve a plot in front of the house to be left in grass and not a few have added lawn mowers to their stock of agricultural implements. Trees and shrubs are being planted solely for the purpose of improving the appearance of the place. New fences are taking the place of old ones and farmers are taking pride in the way their place looks from the outside. We also note a change in the towns and cities. Never before in the history of Toronto have so many verandahs been erected as during the past year. The high board fences that surround so many of our homes are being rapidly torn down; houses are being painted in brighter colors; and people are even taking down the small fences which separate their houses from the road. Here in this beautiful summer resort one would scarcely recognize the Cobourg of a dozen years ago. There never was a time when a knowledge of horticulture would prove so useful as at the present moment. It is a most laudable ambition that neighbor should vie with neighbor as to whose home should present the most attractive appearance, and it is the duty of our local Horticultural Societies to place within the reach of our townspeople all the information possible that will help them in attaining this end.

The School. Twelve years ago at the annual meeting of this Association in Hamilton, the following resolution was moved by your honored secretary and adopted:—

"Having in view the great importance of a more extended knowledge of horticulture in our country, this Association recommends to the Minister of Education the consideration of the wisdom of encouraging the study of horticulture in connection with our public and high schools, both by making it obligatory on first-class teachers after a certain length of time to take a short course of instruction at the Agricultural College, Guelph, and by making each school yard an arboretum of native trees and shrubs properly arranged and labeled."

Unfortunately the ideas conveyed in this resolution have not been carried out yet. Never before was there such agitation as at present for more practical instruction in our public schools. In this day of specialists we find that a boy or girl cannot afford to spend ten or fifteen years in the study of generalities. We know that a young man in business learns more in reference to that business in one year, than he would in his entire school career. In fact, many men tell me that in taking a young man or woman into their employ the first year is largely devoted to the overthrowing of theories and preconceived ideas. We feel that the people are justified in demanding more practical subjects such as manual training, the study of soils, of plants and of animals in our public school classes. What would you think if some one should suggest cutting down the grand old elm trees on the glebe land back of your Episcopal Church, or the maples in the eastern and western end of your town? And yet I doubt whether you ever stopped to think of or to thank the men who planted or preserved

those trees. Whoever they were, these men were practical horticulturists. Suppose the boys and girls of our schools had these things pointed out to them, and were told which trees were adapted to this climate, with the suggestion that they plant a tree at home so that in after years they could look with pride upon the town's improvement and say, "We had a hand in it." I doubt even whether the children know the commercial value of these things. No grown man, or even a normal boy, would think of striking a beautiful horse in the eye so as to spoil his sight, nor cutting off a cow's tail and so spoil the appearance of the animal, and yet even from the standpoint of dollars and cents, because of the ignorant way in which we have destroyed our forest growth, individual pine, basswood and elm trees are worth as much as our ordinary farm animals. We do not propose at this time to go into the relative ethical values of such practical study as compared with mathematics or classics, but we do say that our children should be instructed, or given the opportunity of finding out for themselves more about the living, growing things about them. The boy who spends his time after school hours in gathering plants and insects or breaking open rocks for fossils, is not the boy whom the merchant or banker complains of when he says that his apprentice has to "unlearn" what he was taught at school.

I am glad to see the agitation in this meeting towards more knowledge of what some call Nature Study. Some call it bulletins, some call it agricultural college expansion work—but call it what you like, there is a time, as there never was before in the history, for elementary treatises on our practical home questions. We see it in domestic science, which is a word that we knew nothing about in this country a few years ago, but which is now getting to be a common word in the language of every day. I remember when I was at the Agricultural College the talk about carbo-hydrates and nitrogeneous substances and albuminous substances seemed to me to be words written in a foreign language ; but now at the Farmers' Institute a farmer will rise up at the back and ask how much carbo-hydrate substance should be mixed with nitrogenous substance in order to make a balanced ration ; he does not say, how much "bran" and so on. These gentlemen that you have seen before you the last two days, who are leaders of horticulture in this Province, have been pounding away at that subject. They have been endeavouring through their municipalities, their individual schools and homes and home life to create a sentiment in the communities for a better understanding of the simple laws of horticulture by our children in our public schools. We have learned a good deal about animal life in our schools.

The Province. We have in this Province, according to the latest statistics, 312,787 acres of land in orchards, gardens and vineyards. In apples alone, we find that we have over nine millions of trees. These trees are producing on the average only about three bushels each. Supposing we could, through the Horticultural Societies by the study of insect pests, by improving our knowledge of the art of spraying, and by studying the best means of fertilizing and cultivating the soil, increase the yield of these apple trees one bushel each, what would we have accomplished ? This would give us three million barrels more apples, and at the rate of say $1 per barrel we have, without increasing our acreage at all, added to the value of our apple orchard three millions of dollars.

Then, again, we need to give more attention to the packing, grading and handling of the fruit. How long would you deal with your grocer if, when you ordered one dollar's worth of sugar he should send you up a mixture of granulated and three or four shades of brown ? And yet brown and granulated sugars both have their uses. So with our apples. When the fruit is graded, as has been repeatedly shown, not only is a better price received for the first grade, but also the second grade. if it be an even lot, is more valuable than the mixture. In the matter of packing also, attractiveness counts. I know one man in the Hamilton district who says he will never ship apples in a barrel again. He puts them all up in boxes with excelsior top and bottom and gets more money for them in this way. This is a feature of the work, then, in which our Horticultural Societies can help. It may be said that this commercial side of the work has nothing to do with the people of the towns and cities, but with this I do not agree. Our towns

in Ontario are prosperous just in proportion as the farmers surrounding them are prosperous, and the town which lies in the centre of a district surrounded by a rich deep soil, is the town which will make sure and rapid growth towards cityhood.

It is the duty, then, of our town organizations to co-operate with the farmers and gardeners who are producing the very foods that are necessary for our sustenance, if such towns are to reap the benefits of the farmers' prosperity.

In conclusion I would say that I have touched very lightly, if at all, upon the organization side of our work, but I would say that each Horticultural Society has an opportunity of doing for its members and the community at large a work as noble as that of any organization in existence in this Province to-day. Let us then as a people learn lessons of wisdom from this and kindred societies and from nature, and let us endeavor to learn those elements which tend to stability of government, the promotion of health and the present prosperity and happiness of our people. (Applause.)

POSSIBILITIES IN HORTICULTURE.

By C. C. James, Deputy Minister of Agriculture, Toronto.

Supposing I were able by some magical power to pile up on this table a glittering heap of golden nuggets, just such a pile as was to be seen at the Glasgow exhibition this year, and I would say to you, "This pile of gold has come from a certain country ; would you not like to go and live in that country ?" Your first inclination would be probably, "Why yes, any country that produces gold in that abundance must be a magnificent country to live in." That heap of gold was labelled "Yukon". Gold is a good thing to advertise a country, and it was used with magnificent effect to advertise Canada this year, but when we say that gold came from the Yukon, you can see that gold does not necessarily indicate a fine country to live in. We will take that gold away and pile up wheat on that table from one end to the other, and I say to you, "All this wheat has come from such and such a country, would you not like to live in that country ?" You reply, "Why, yes, a country that would grow wheat like that must be a grand country to live in." Well, that wheat came from the treeless prairies of North America—away out on the boundless, solitary, treeless prairies. Perhaps it came from some of the rich prairie land of South America, or perhaps it came from some of those unattractive rich bottom lands of Russia. You come to the conclusion that a country may grow wheat to perfection but may not be an attractive place to live in. Now we take the wheat away, and bring here an assortment of fat bullocks and sheep. You look at them and say, "A country that produces those must be a rich country ; surely that country must be a fine country to live in." Well, we say that these have come from some unheard of section of Australia, or perhaps from the Argentine Republic in South America ; and you say, "A country may be able to produce magnificent animals like that, and yet be unattractive as a home." But in place of that we put before you just such an array as you have here to-night, and in addition to these magnificent looking apples we add peaches, and pears, and grapes, and flowers of all kinds. I think you will all admit at once that a country that will produce fruit so attractive in appearance, and so delicious in flavor, must be a grand country to live in no matter where it is. I think you will now see why our Government has felt it so important to put before the people of other countries, not simply our gold as an attraction, not simply our wheat, not simply our cattle and horses and sheep and swine, but they have felt it important first and foremost, to place before them the fruits of the country, knowing full well that the old saying, "By their fruits ye shall know them" has in this connection a significance that does not belong to gold, or wheat, or live stock. (Hear, hear.)

What I have said will, at the same time, indicate to you that a country that produces fruit such as we have here to-night has raised itself quite a bit above the level of a country which simply digs gold out of the ground, or a country which simply

produces wheat to feed the world, above the level of a country which has its great flocks and herds. A country that has a large and important class of fruit growers in its midst has already assumed a very high position as an agricultural or productive nation. And so, when you come in contact with the horticulture of this country, its fruit growing, you are coming in contact, not with the lower levels of our agricultural production, but with the higher levels ; and you have only to come in contact with a few of the men who are concerned in it to know that what I am saying is more than true. If you still have any doubts about it, I would simply say, attend the conventions of this Ontario Fruit Growers Association and all doubts will be dispelled. I will guarantee this, that you cannot find in the Province of Ontario any association of men in connection with our great city industries or in connection with our great professional lines, and will canvass more thoroughly the questions with which they are vitally concerned, or doing their work in their conventions more thoroughly than the Association that meets here to-day. This Association is very old. It is the oldest Association that we have in connection with the Ontario Department of Agriculture ; and for that reason we have always had a very warm spot for it in our heart. This Association is older than the Province of Ontario ; it began before the Province began, having been organized in the year 1859, and there is now sitting on this platform, an honorary member, the only one alive, I believe, of those men who first organized this Association, Mr. A. M. Smith, of St. Catharines. (Applause.) It has been a forerunner of other associations. After it, there came under the Government's wing the Entomological Society, and one after another of the Live Stock Associations, until now we have a large number.

What is going to be the effect of this Association upon Cobourg and its vicinity ? You have heard to-day speakers from as far east as the Ottawa Valley, and also from the Province of Quebec, and the gentleman who is to follow me comes from the garden of the Gulf of St. Lawrence. We have heard, also, men from the West and Niagara District, from the Georgian Bay, in fact the whole Province of Ontario is represented here, and these men who are among the very best in their work are here giving information to one another and getting information from one another. Unless some permanent results come from this meeting it will have been a great mistake, and the Association might far better have met somewhere else. Why does it move from place to place ? Simply that these various localities may get the benefit, that the persons resident at or near those localities may meet, and the benefits of this Association may be spread, over that section. Now, how can this Association be of benefit to this place ? You have in your midst a local Horticultural Society, and though it is active at present I suppose there are greater possibilities ahead of it ; and if this Association meeting stimulates the local organization to greater energy and more active life, it will not have met here in vain. Now what can that local Association do ? What is it doing? Is there any work yet to be done ? I suppose after all these questions largely resolve themselves into questions of dollars and cents. Upon what is the prosperity of Cobourg depending ? You have your local industries, and the local Horticultural Society has nothing to do with those. You have the locality round about. Mr. Creelman referred to the possibilities that would result from the improvement of our orchards throughout this Province. You have only to look at the orchards located within the confines of Northumberland and Durham to see what enormous possibilities there are right along that line. To narrow it right down to your own town, what can your local Horticultural Society do to improve your condition ? Well, I suppose from the standpoint of Cobourg being largely a summer residence place, the question of the local improvement in the appearance of this town may be said to have a first and very important place. I was wondering as I came in on the train what the impression is on a stranger coming into the Town of Cobourg. Now, you are peculiarly situated here ; every train going east and west stops at Cobourg ; you are not side-tracked like some other towns ; every person has to stop over here. The boats, going and coming, frequently bring passengers past your door ; and as I have come and gone I have wondered whether your local Horticultural Society could not develop into what is becoming a very popular movement on the other side.

namely a Local Improvement Society. If, for instance, strangers coming into the station could see there a very attractive bed of flowers and a few hanging baskets of flowers, etc., that alone would almost be enough to get some of them to stop off here. We have a few railway stations in Ontario that have been laid out in a particularly attractive manner, and you will hear people all over the country say, "Did you ever see the beautiful flowers at such and such a station ?" and so on, and I have wondered whether the local Horticultural Society could do something in that line, to attract the eye and the attention of the people coming and going ; to indicate to these people, who otherwise would be unaware of it, the fact that right here in Cobourg you have a large number of people who love flowers, who love a beautiful place, and have made of this town one of the most attractive spots in the Province of Ontario. Your lake front, also, can be very greatly improved. You have made a beginning in connection with your park, and it seems to me that the local Horticultural Society in its local improvement line could do a very, very important work so that those who come in from the south by water would have their attention attracted at once in that connection. Then suppose we could go throughout this town and remove all the unsightly fences—(hear, hear)—and introduce fresh grass along the streets and in front of the houses ; and then supposing we could go to the schools next spring and as every pupil passes out give him or her a small packet of seeds ; what would follow ? As I passed this summer through a number of old-fashioned English towns I looked at them and wondered just what was the attraction, about those places—stone walls in most cases, old stone buildings, nothing attractive about them. There was an answer in front of every door ; there were flowers on every window sill, there was a little box of flowers, and even if the patch of green at the front door was not larger than the top of a table, there were flowers ; you could not get away from the flowers, and those little stone houses, some with thatched roofs and others with slate roofs, that otherwise would have been an eyesore and unattractive, simply because they were dressed in those gay flowers which cost very little money—they were not those expensive roses and other flowers that are rare and readily killed off—but simple old-fashioned English flowers; because of these flowers there was a charm and beauty in these little places. And I have often thought that if we could go up and down through the main street in this town, for instance, and see the windows filled with boxes of flowers, and if we could get away those old unsightly fences—they are going gradually, but perhaps they could be hurried—and have more grass, and if we could make attractive entrances to the town, if some work of that kind could be undertaken and pushed on and hurried along by your Horticultural Society, then it would certainly be living up to one of its objects, and would become indeed a local improvement society. And what would be the result ? What has been the result in these enterprising New England towns that have had those enterprising local improvement societies at work ? Hundreds of trees from year to year have been planted, the places have been beautified. The houses are not as good as ours—nothing but frame houses, but they receive their fresh coat of paint every year, and around the verandahs you will see the roses and other flowers climbing up. The place is open so that the public can get a good view, and it is like walking about a great park, and as you walk along you feel, "Well, I enjoy this place, and though I do not own those houses and the grounds, yet they belong to everybody and I seem to have a place here." Life under those circumstances seems to be worth living far more than in some other places where people pay no regard to appearances but put all the money on the insides of the houses. This is simply thrown out as a suggestion, and what I know is being gradually worked out in connection with your local Horticultural Society, and it seems to me that if this Provincial Association can only give the impetus to this work and attract attention to it so that there will be brought into this Association every resident in this town who thinks that life is worth living afer all, then this Association will not have met here in vain.

Just a word before closing in connection with horticulture as a business. I had an opportunity a short time ago of attending a meeting in the city of Toronto at which some addresses were made by some of the most successful business men and financiers of that city, and in addressing the young men to whom they were talking, one

after the other said, "Now, if you will only fit yourselves properly for the work you will have no difficulty in finding work to do. There are places in connection with our great businesses for well educated, well trained men;" and one man said, "There is not a great mercantile or financial institution in Toronto to-day that has not a place vacant somewhere near the top for a bright, enterprising young man if he is only capable of filling it." I had an opportunity shortly after that of addressing the same people, and I said, "You may think perhaps that what I have to say is not very appropriate, but where one place has been indicated by the gentlemen who have preceded me in connection with our financial and mercantile institutions, I can point you to an industry where there are twenty vacancies, and that is in agriculture and the various lines of work associated with agriculture. There is no work in this country that is reaching out and demanding young, well trained, well equipped men as is agriculture, in some of its various forms. There is nothing to-day that presents so wide and varied a field for work as does horticulture, for instance. We might start at the bottom and show you from the soil right up to the finished fruit and its preparation for market and its marketing, there is a demand upon the men who are going into it for a higher class of brains and of skill and industry than is demanded to-day by any other work that is being carried on in this Province of Ontario. There are certain lines of work that narrow a man, and a man has, to a certain extent, to make himself a machine; but the moment a man in connection with agriculture or horticulture makes a machine of himself he is doomed to failure. You cannot become to-day a succesful horticulturist if you make a machine of yourself. Back of all your work there must be that keen, active, energetic, wide-awake brain which will solve difficulties that will never present themselves along any other line. A perfect apple or plum or peach in large quantities of a saleable nature, just such as the world is asking for and is willing to pay for, demands a far higher class of ability than the production of nine-tenths of the articles that are coming out of our factories in our large cities. Thus horticulture is demanding to-day the best young men in this country, and our young men who are looking around for work should consider that here in this field there are openings without limit, and here is a field that will not only give them a good living if they are willing to work, but will give them scope for the development of their brains, here is a work that will bring them out in contact with nature, that will have a strong tendency towards the development of their social faculties as well, that will not make a machine, or a drudge, or a slave of a man. Here are opportunities for young men that are not to be found in any other calling in this Province. I would like to see a great many of the young men of our towns and cities who are to-day thinking of making doctors, lawyers, professional or business men of themselves—I would like to see a great many of those young men who are just on the threshold of life wondering what they are going to do—give a careful consideration to this question of horticulture as a pursuit for a bright and industrious young man. Do you want to see some of the ideal homes in this country? I would simply ask you to go to the fruit-growing regions of the Province of Ontario. Have you ever been around Burlington Bay and through the Niagara District? Have you ever been up around the shores of the Georgian Bay? Have you ever been down in the county of Prince Edward? I will not say that you will find there the wealthiest homes in the Province of Ontario to-day; I will not say that you will find there men who have nothing to do, and families that are living in luxury and at ease; but I will say this, that in some of those sections where fruit-growing is being made a specialty and where they are working along the best lines, you will find more social success, more home happiness, more true, genuine, home comforts on the average than anywhere else in the Province of Ontario, (Hear, hear). Now, if that is what you are after, a good living with a good time, accompanied of course by good earnest hard work, and work that is mental as well as physical, then I say that the horiculture that we have been talking about so much for the last two days presents a most attractive opening for the young men of this Province; and if we could only turn into agriculture and horticulture a good deal of the energy that is now going into our towns and cities, if a great many of the men who are bound to make millionaires of themselves, and have very little idea of what stress and discomfort is

ahead of them in that—if we could only turn a large number of these out into the country towards the fruit farms, and the dairy farms, and the live stock farms, and build up that part of our country, I would not give one moment's thought or consideration to the question of the building up of our towns or cities, because just as we can produce fruits like these, and butter and cheese that will satisfy the discriminating taste of the Old Country people, and just as we can supply beef and mutton and those other products on our farms in sufficient quantity, just as we can produce those in fair quantity, but of the highest quality, so will the success of this country be assured. It will not depend upon our gold mines, but upon just such things as you see here. A few apples may seem a very small thing, and this Association perhaps may not loom up as important as an Association of bankers or some other financiers, but if it were not for Associations of this kind there would be no necessity for Bankers' Associations ; and if it were not for the work of men such as are around this platform and that are all through this country, there would be no necessity for the great manufacturing establishments, there would be no great necessity for towns like Cobourg and other places. You will find as you go back that after all it is upon the apple barrel, and the cheese box, and the side of beef, that the true prosperity of this country is based. It is not a question of whether we are going to find more gold in the Yukon or not ; but if we can go on producing and improving our apples and the other products I have referred to, then we will be helping to develop that which is after all the true basis of the prosperity of this country.

The President : We are very glad that we have a gentleman from that Province down by the Sea, Prince Edward Island, who takes an active interest in horticultural matters, and I heartily wish that many others in his calling in life would do the same. I think that they would be better able to reach us on the Sabbath day ; I think they would get a little nearer the hearts of men if they knew a little more about horticulture than they do. The Rev. Father Burke of Prince Edward Island will address us on the general phases of Maritime Fruit Growing.

ADDRESS BY REV. FATHER BURKE, ALBERTON, P. E. I.

Rev. Father Burke was received with applause and said : I assure you it is with very great pleasure indeed that I came up here from the little Province of Prince Edward Island, not to teach you anything at all, or to say anything that will be specially instructive, but to look upon your pleasant intelligent faces, to mingle in your meetings that have given us such satisfaction and pleasure, and to go back to my own little Island, where we are in our babyhood in these things, and by some process of osmosis, as the doctors call it, to impart this knowledge which I gain here to my own people. I came from the smallest Province in this great Dominion, but so far as horticulture goes it is certainly in a position of reaping great benefits from these sciences, and I only hope that many of the people we have been listening to in these meetings will find time to come down and see us and contribute to the general information of our meetings, to help to uplift our community and speedily put us on in the way of progress such as agriculture and horticulture have taken upon themselves in this Province of Ontario. I must compliment you upon the success of these meetings. We have had very serious meetings indeed, and some serious subjects this evening, and I hope I will not make myself too serious. The President thinks that if the clergy mingled more in meetings such as are now taking place, the people would be better able to listen to us on Sundays. I did not come here to preach to you, and therefore make you feel unhappy immediately—(laughter)—my subject will not be found of that kind at all, but I will simply give you a little bit of the history of horticulture in our own country. Before doing that I wish to say I have been delighted with the reception that has been accorded me here, and delighted also with mingling with the people of Ontario, and finding that they are the best people that you could possibly meet with. (Hear, hear). It is well to rub shoulders sometimes, to know the people that comprise the population of the different provinces of the Dominion, and by that kind of intercommunication and intercourse we learn very much which we can impart to advantage to our own people. Now you think that these

meetings are of a mutual admiration society. It is true we all compliment one the other, and it is expected that an Irishman will be able to put the compliments on double thick. (Laughter).

It would be presumption in me to attempt to say anything to a community such as this on the subject of horticulture in the Maritime Provinces, therefore I will not go into the special phases of that question, but merely tell you that we are in our infancy in that regard, that we have been learning our lessons from the good mother society in Ontario. We like to get something from Ontario for nothing, because I am sorry to say that we have to give Ontario nearly all our resources, because we ourselves are not able to procure for ourselves the things which we stand in need of, and which Ontario produces in such quality and in such quantity. We are a purely agriculture community, a small island, as the late Governor Howlan, one of the greatest agriculturists, called it, "A million acre farm." We have a farm one end to the other. As one of the members of Parliament said, when one of our members was insisting on something, "Why, you could take it and let it splash in one of our lakes and you'd never hear the splash even." (Laughter). We are small, it is true, but at the same time we have our own interests. We are an agricultural community, and because we have no manufactures of our own we are obliged to receive from this great Province of Ontario nearly everything that we consume in that regard. Therefore if you look into the statistics of this country you will see that we are importing and consuming more per head than any other Province in this whole Dominion. That may be a good thing, or it may be a bad thing, but everybody will admit that it is at least a good thing for the people who are making money out of us. (Applause). Now there are some things that we are getting from you for which we are not giving very much. Only a few years ago, when agriculture took a different turn, which it has taken in this country, and for the better, that great friend of agriculture and of the general advancement of the country, Prof. Robertson, came down to us in Prince Edward Island, and by a co-operative movement among our farmers established cheese and butter factories. From having not one pound of either of these products, or perhaps a few scattered pounds of what was called "bad dairy butter," we have in the last ten years come to this, my friends, that we are receiving from those products of cheese and butter the round sum in that little Province of almost one million dollars. (Applause). This is a great result in those few years, but we have not yet quite discovered that we are in a position to receive almost that amount of money from the products of our orchards. Although we are small, we have provincial autonomy and all the paraphernalia of Parliament. One of our own Prime Ministers, who was not as pariotic as he ought to be, and who had his own prejudice deep-rooted—as people generally have, they say, the deeper in the smaller communities—stated openly in Parliament that it was useless for us to talk in Prince Edward Island about apples or fruit at all, that we never could grow apples. After that apples began to be produced, they began to be shown upon the tables of our exhibitions, and because our resources are small I am sorry to say we have not nearly as many of these exhibitions as we ought to have, but the fruit was shown and immediately set the people thinking. Strangers came there and said, "It is beautiful, looks well, at least externally, whatever it may be in the interior, as to the quality of the fruit that is produced." And when they examined that they found, strange to say, that we had as good apples as were being shown over in Nova Scotia, which already had a reputation for at least one quality of apples, Gravenstein; and as we were getting much fruit from Ontario, fruit was produced there that even compared with this Province. Then we commenced organization. I wrote here to my friend, Mr. Woolverton, and he immediately gave me all the information that was necessary—not only that, he met us more than half way in our demands, and helped us out with that information which his "Horticulturist" has given to us, and which is of such great benefit to all Canada. (Applause). Now we have a great deal to be thankful for. We are imitating this Association of Ontario so far as we possibly can. We found it easier to follow example than to obey the precepts that we get—nobody knows better about that than the preacher who has to preach on Sundays, and see, at least in many cases, that people do not live up to

the preaching that is given to them. We are trying to follow the example of the Fruit Growers' Association in Ontario, and they have set us a very good example indeed. We have been organizing and trying to hold meetings. We have had speakers from the Experimental Farm at Ottawa, who have given us instruction, and we have commenced to look to our orcharding, and have asked the Government to give us assistance, and we will get all we possibly can out of them, because they will get all they possibly can out of us. We find always a good friend in Prof. Robertson, and we have his assurance that some good men, likely from Ontario, will come down to us in Prince Edward Island, and if they are single people we will find for them down there one of the best looking girls whom they may take back with them to Ontario. (Applause). We have only a population of 120,000 people, our Island comprises only 2,000 square miles ; your Province is 111 times larger than ours, and therefore it would not be expected that we could get up institutions like you have. I am much pleased to see the enthusiasm you have thrown into your work here, and am glad to know that the report of your lectures and discussions here will go down to our people, and that many of them will receive valuable lessons from them, and I hope that as many of you as possible will come down and visit us. I am sure that in the summer months Cobourg is a delightful place, but people who have been down to my county will tell you that that is one of the beauty spots of the whole Dominion of Canada. (Applause.) Come down and we will take you to our hearts and extend to you that hospitality for which islanders, not only upon this side of the Atlantic, but on the other, too, are proverbial. There may be a little selfishness in my invitation, because if you come down we will likely have a little of your money, but as we give you a great deal for your manufactures you might give us a little bit of that which you spend so freely on pleasure. Two or three years ago, under the influence of the Fruit Growers' Association of Prince Edward Island, we made a shipment of apples to the British market, and I think we must be very honest people, because we never heard any complaints whatever of anything being wrong with the middle of the barrel. (Laughter.) We received word back from the very first shipments and from those that succeeded, that all the apples that we could grow of that variety could be sold at a price profitable to us, and to the greatest possible pleasure of those that were handling them in Britain. That is a great compliment to a people who are only starting out in that industry, and I think I am only paying myself and the other preachers of Prince Edward Island a compliment when I say that our people have not found out the way of being dishonest in that particular industry. (Laughter.) And we hope to continue in that way, and to make them not only honest in that regard but in every other possible regard. Nova Scotia has shipped a great many apples, from none at all almost forty years ago, to nearly a million barrels a year or two ago, and this year, although the crop is short, she has some 350,000 barrels of apples gathered from her orchards, the major part of which she is able to ship to the British market, while you have very few here to ship, I am sorry to say. We in Prince Edward Island have had a very dry year. When I came along in the train Prof. Robertson was telling me one of ex-Governor Hoard's stories, about an Irishman who was complaining that the season was so dry that even the pigs themselves had to be soaked to make them contain the swill. (Laughter.) Now you can see what a very great drouth has existed in that country, and as far as we were concerned in our Province we have had a very great drouth indeed. The fruit formed upon the trees, but from the 25th April to the 25th September we had no rain, and as a consequence much of the fruit fell off the trees, and our crop of apples is very small indeed this year, but we hope for better things next year. We are doing all we possibly can from the impulse we receive from such an Association as yours, and with the assistance we get from Ottawa, to see that our orchards are set out properly, to get the proper varieties to be grown in our country ; for commercial purposes the Ben Davis seems to be our favorite, and we are setting out many trees and attending to them, and we hope we will soon receive from our apple crop more profit than we receive now from our berries. I only hope that this Association will continue to do its duty, that the dishonest phases that now attach to the apple industry will quickly pass away. I

hope the people in Britain, when they see an article that is marked "Canadian," will immediately place it as among the first things in quality of that kind that can possibly be put up the market. I hope that there will be no suspicion whatever upon this industry, and that we may go on in leaps and bounds, and that one Province may excel in one thing, and one in another, that there may be enough good result in them all that they may join hands in the prosperity of the country and make it what it ought to be. We are a loyal, patriotic people to the institutions of the country, but that is not enough. We must all try to do all we possible can to push forward the industries of the country, because the people who are made more prosperous materially will be a better people in every sense. Now it has been said sometimes that the priest should stick to his prayer-book. Well, we have lots of time to pray, and lots of time to be of assistance to our people, and while we are giving assistance to our people we are in one continual prayer—(applause)—and therefore, although I have come a very great distance to be here, and come at some considerable disadvantage, I could not refuse the invitation extended to me by the Secretary of this Association, who has been kindness itself in regard to our initial industry down there, and the work which we are striving to do, and has done everything he possibly could to help us, indeed sometimes at great personal sacrifice. I could not refuse him when he asked me to come up and say to the people of Ontario one single word on horticulture in Prince Edward Island. These have been very scattered sentiments on horticulture, but they have been simply thrown out in order that you might see our good-will, that we are anxious to mingle with you and learn from you, and if we have anything in which we may instruct you we will strive to give you that instruction, so that one may benefit the other. I thank you for the way you have received me in this grand Province of Ontario, and I hope when I come back that you will be going on in the same lines as you are now, that you will continue to be the Premier Province of Ontario, that you will benefit us, too, by the instruction and by the work you are doing. (Applause.)

AWARDS OF MEDALS AT THE PAN-AMERICAN EXPOSITION.

Mr. W. H. Bunting of St. Catharines prefaced his reading of the list of awards of medals for Ontario fruit at the Pan-American Exposition, Buffalo, with the following remarks : Some months ago, when I had occasion to send out a call to the horticulturists and fruit growers of this Province to assist in connection with our exhibit at Buffalo, I am pleased to say that there was no section in the Province from which I received a more cordial and hearty response than from these united counties of Northumberland and Durham. Headed by your worthy warden, Mr. Rickard, a large number of your representative men in these counties came forward nobly, and I can assure you that a large measure of the credit which our Province has gained during the past season is due to the gratuitous and hearty efforts that were made by the gentlemen from this district who came forward and assisted me so nobly, and I am glad to say that to this section no inconsiderable number of these awards have come. Reference was made last night to the very cordial relations that have existed of late between our American cousins and ourselves. Prof. Van Deman was kind enough last night to refer to your representative at Buffalo in such kind terms, and I wish to say in his hearing that all through the past few months in connection with my duties at Buffalo from start to finish I received nothing, and those assistants who were with me received nothing, but the utmost courtesy, the utmost good feeling and the greatest assistance from the gentlemen in charge at Buffalo and from the various people with whom we came in contact. (Hear, hear, and applause.) Perhaps the most pleasant recollection we will have of our visit there is the fact that we were thus received and assisted ; and even in connection with those with whom we came in friendly competition, although it was stated time and time again that our efforts there forced the representatives of the other States to make extra exertions in order to keep up in

their display with the display that was being made from Ontario. Although there was this friendly rivalry and competition, there was nothing but the utmost good feeling prevailing from start to finish, and this is one of the pleasant recollections and experiences of the last six months. It was very pleasant last evening for me to hear the very kind words of Prof. Van Deman in reference to the efforts that were put forward by us at Buffalo. I can only say that we are not deserving of anything complimentary whatever ; we simply went there endeavoring to do our duty as well as we could, and the greatest pleasure we have at the present time is the fact that the Province of Ontario took no mean place in connection with the exhibit at Buffalo during the past season—(hear, hear)—and that we were successful in carrying off a large number of awards, which you find represented by the profusion of banners spread abroad in this building this evening. (Applause.)

THE ORCHARD, PARTICULARLY THE DEVELOPMENT OF FRUIT BUDS.

Prof. Waugh, Horticulturist of the State of Vermont, gave a lecture on this subject, illustrated with lantern slides. The hour being late, Prof. Waugh was obliged to condense his lecture, which was very instructive.

COMMITTEE UPON APPLIANCES.

The Secretary : I would like to move an additional committee. We have at our Association meetings from time to time a great many interesting appliances on exhibition for the use of the fruit grower. We have now the expansive tree protector, some spraying pumps, and a very valuable invention for the grading of fuits which I think is going to be of great importance to us. We do not wish to advertise these articles for the general public at all, but we want to have a committee to report upon them to us, what that committee of our own appointment think about them, and whether they are really of any value to us. I move that this committee be appointed, and consist of Mr. Scarff of Woodstock, Mr. A. M. Smith of St. Catharines, and Mr. J. E. Orr of Fruitland, and that they report to us this afternoon. (Carried.)

PRUNING.

By W. N. Hutt Southend.

The subject of pruning is very important. Pruning is a means to an end, and the end in view will determine in a great measure the kind of pruning we will do. For instance, if we are pruning for wood growth we prune after a certain fashion ; if we are pruning for fruit we prune in another way; and if we are pruning for shade we prune in still another way. Of course in pruning the practical man should always have an idea of what he is about. Pruning seems to be a necessity for trees ; in fact they are pruned in their natural condition. Every year the leaves are cast off the trees ; this is Nature's method of pruning. Besides this, there is a constant pruning of buds and branches. If every bud on the tree were allowed to develop the tree would become a veritable brush pile, but in the natural way those buds which are at the ends of the branches get more sunlight and have better advantages of growth; they consequently grow larger in size, and those that are in the rear of them become starved more or less, and do not develop, and may even fall off. You notice that in this limb the larger buds are at the points of the branches. As most of the wood of the tree is made from the atmo-

sphere by means of sunlight, those that have most sunlight of course make most growth. So these in the rear are consequently deprived of their nourishment to a considerable extent, and become dormant. So you notice that trees prune themselves naturally. (Sample limb shown.) Take an ordinary growth. You notice its buds go around in spirals, but in this limb you have not that at all—Nature has pruned them off in her natural fashion ; they have become dormant and dropped off. In the same way trees are pruned of their branches ; those that are in the centre of the tree and underneath the crown do not get sufficient sunlight to perform their functions, and the branch becomes weakened and dies, and then the wind comes along—Nature's pruning knife—and cuts them off. Thus you find in the woods a great number of limbs that have fallen off. And this natural pruning seems to be an advantage to the tree. Those limbs that remain are less crowded, and it is to the general advancement and growth of the tree. The trees of the orchard, however, are not strictly under natural conditions : we might say they are hyper-natural ; that is, by the arts of the fruit culturist and gardener we have raised that tree from its natural condition by selection, and pruning and fertilizing, to make a highly specialized growth. The trees in the orchard have simply been reduced to machines for producing fruit; and it is necessary that we should understand the working parts of this machine in order to make it produce as much as possible, of the best quality possible, and to keep up that production for the longest time possible. If you take a cross section of a limb or trunk of a tree you see it has a very characteristic appearance; the outside bark and the inner portion, darker in the centre and lighter toward the outside. Just between the bark and the wood, if we could see it, is a very delicate substance known as the cambium. This is the most important part of the tree, because from the cambium the growth of the tree takes place, and it is the only tissue that retains the power of active growth from year to year. This cambium is composed of a thin layer of tissue. It occupies a very small portion of the trunk, and you cannot see it in this dried limb,but if you take a fresh tree in active growth in the springtime you can tear off the bark readily and find the cambium beneath. It then shows as a soft, doughy or slimy substance that you can scrape off with your thumb nail. It is a very delicate substance. Exposure to the air will kill it in a few minutes. Examined with a microscope, it is composed of numerous brick-shaped cells put end to end, several rows of them. In the growing season they split down the centre and give off on the inside a layer of wood, and the outside a layer of bark, and then a small portion of cambium is left till the next year to carry on growth. It is a very delicate substance, and it is owing to the injuring of it that the trees show disintegration on the outside. For instance, if a tree is struck with something so that the cambium is bruised underneath, you will probably have a wound there on the side of the tree. As there is a ring of wood and a ring of bark formed every year, so the cross-section of a tree is the life history of that tree. Some rings are wider and some narrower. A wide ring shows a year of very favorable growth, or probably that tree has been well fertilized at that time. Other rings appear very small, probably because the year has been very dry, or the leaves may have been eaten off by insects. There are just as many rings of bark on the outside as there are of the wood; but as the tree becomes older the pressure from the inside bursts the bark, and it scales off from the outer portion, but there are several layers of it remaining to cover the cambium beneath. If we could look at the bark with a microscope we would find it composed of cells just like the cambium, but of a thin, corky nature. As Prof. Robertson said yesterday, still air is a non-conductor of heat, and it serves that very same purpose in the bark. Each cell contains its particle of air, and then another cell overlaps that, and forms a dead air space around the delicate cambium beneath and protects it from frost, just as in a building the dead air space is formed by the studding on the outside and the plaster inside. It keeps the cold from passing in and the heat from passing out. So you see how careful Nature is of these very delicate structures, the bark being a protection from frost on account of its dead air space. Then the outside wall of this cell of bark is of a tough, corky nature, is impervious to water and forms a water-proof cover for the tree. The sap in circling cannot pass out, and the cambium

cannot be dried out, but the sap must pass through the natural channels of the wood. The bark keeps all water from passing in and the sap passing out, and so is a perfect protection for the cambium external beneath. Nature is very careful of these delicate structures, and in all our operations of pruning we should be just as careful. It is a very bad practice for a farmer to allow any person to work in his orchard who is not pretty well posted on trees and their growth. We used to have the itinerant pruner, who went around and the value of whose pruning was judged by the number of limbs he took off. I think pruning, if not done by the owner of the orchard, should be done only by an employee in whom the owner has great confidence. We have the bark of the cherry that on the outside is of a very tough parchment-like nature. You have sometimes heard the remark that trees sometimes get in a hide-bound condition, the bark getting so tough that the trees cannot break through it, and it used to be the practice to take a knife and cut through the bark so as to allow the trees to expand. That has always proved to be a very bad practice, because if you cut through the bark the danger is that you will cut a little too deep and cut into the cambium, and cause a wound down the side of the tree. Even if you do not cut too deep the probability is that the pressure being removed just in one place, the tree will expand there and you will get an ugly growth on the side of the tree which later will split open. Nature seems to provide for all these difficulties, and after a while, if the tree is kept in a growing condition it will rupture the bark itself, here a little and there a little, and the tree will expand naturally. We can assist Nature by keeping the tree in a healthy condition, keeping it growing, and if we do that it will take care of itself, and we need never cut the bark of the tree for that purpose.

Mr. Boulter: Would you apply that principle to an apple tree as well as to a cherry tree?

Mr. Hutt: I do not have that difficulty with an apple tree, because the bark is not of a parchment-like nature. The bark is the natural protection of the wood, but the outer bark that scales off is not of very much value—it is the inner bark, the layers that are still growing, that are the natural protection of the tree. I would advocate scraping trees, if you do not scrape too closely, so then the rough edges are removed and insects have not a chance to harbor there. I do not believe in cutting a so-called hide-bound tree.

Mr. Graham: I saw a young orchard this season of 500 Ben Davis trees, and they were split right down the trunk of the tree; that is, the bark, I mean.

Mr. Hutt: We do not want the bark to split, because if the bark splits, unless it is covered with something, you will have a wound there. I have never noticed that with apples trees, but I have with cherry trees.

Mr. Graham: Prof. Bailey advocates slitting the bark of the cherry trees down.

Mr. Hutt: It might be advisable in some circumstances.

Mr. Boulter: I have slit trees down with a knife and had them growing over very nicely, and had very good results.

Mr. Hutt: Why would you slit the bark of an apple tree?

Mr. Boulter: To let it grow faster.

Mr. Hutt: If you injure the bark there is a wound to be healed over, and the tree is not in a normal condition until the wound is healed over.

The President: May I ask Prof. Van Deman to give us a word on that?

Prof. Van Deman: I do not want to interrupt the lecture. If I were to take sides I would side squarely with Mr. Hutt. Nature knows what she is about. Nature knows how to grow a tree. Don't you suppose that the skin on a man's leg expands just as Nature demands it? And it is the same with the bark of a cherry tree or any other tree. No, let Nature take her own course in that respect. I do not believe there is such a thing as a hide-bound tree. I do not think there is any more use of splitting down the bark of a tree than there is of splitting a pigs' leg in order that the pig may grow. (Laughter.) I do not think it is reasonable at all. Of course we can help Nature out. The bark is there for a certain purpose; it is a non-conducting material that is placed there for the protection of the parts within, and if we do not interrupt

Nature's work the tree will place its bark just as it ought to be placed, that is my opinion. Of course I believe in pruning, but not in splitting bark.

Mr. Boulter : Have you noticed trees that have been split down ?

Prof. Van Deman : Yes; I have done it myself.

Mr. Boulter : Have you seen any bad effects ?

Prof. Van Deman : Yes, I have, because it makes an abnormal growth in one place. It relieves the strain in one particular place, and there is an excessive growth there, and it puts the tree out of balance.

Mr. Boulter : Suppose you split all around the tree, would there be abnormal growth there ?

Prof. Van Deman : The effect would not be as harmful as if you cut it in one place; the more places you cut it the better it would be, but I do not see why you should cut it at all. Why, there is power in that cellular growth that would split a cannon. It is bound to come out, and wherever the strain is greatest the bark will split soonest, and Nature will take care of that bark-splitting business if we will just keep the tree growing.

Col. Roger : I have learned a great deal in the last ten minutes. I have had a great deal of trouble in employing pruners in my orchard, to prevent them from doing something there that they think is very clever. When you get one of the ordinary mechanics, after sawing a limb he takes his knife and pares it around, and I have one man particularly that I almost fight with to prevent him from making a round top to the wound. Although I am only a practical m an, and do not pretend to be scientific at all, it is my opinion that if you round off that knuckle at all you have just that much additional raw wood to cover with the new growth. Am I right ?

Mr. Hutt : Yes.

Col. Rogers : I am glad I am right, and if I had some of my meñ here I would make them ashamed of themselves, because they said, "You want to pare that round ; it looks neat." "Well," I said, "that is where the new growth comes, and the more you cut off the longer it will take to heal over."

Mr. Hutt : Exactly.

Col. Rogers : I like to use as fine and sharp a saw as possible, leave the wound as smooth as possible, so that it won't catch and droop. I have learned one thing in this room that is worth a great deal to me, about sawing the limbs with a slant instead of square off, that will shed the moisture and the rain and lead to the speedy recovery of the wound. Would you advise painting, or using something in the way of grafting wax ?

Mr. Hutt : I will mention that a little later on. To proceed just where we left off, speaking of the function of the bark, it shows how careful Nature is of these delicate structures. I have samples here of injured limbs, showing how slight an injury will make considerable effect on the tree. Here is a limb that has a roughened portion caused by just simply swinging in the wind and knocking against something else. This was taken off a tree last year that was hanging with rows of apples, and there was only one apple on that limb, showing the effect of the injury. Here is another that has a great ugly-looking growth made in the same way, the limb just swinging back and forward, and the insects have got in here and made this their harbouring place. Here is a wound caused by a ladder, making an ugly-looking growth. Here is a wound caused by the heel marks left by people climbing in and out of the tree. We should prune with rubber boots on, the same as is done in packing trees in the nursery and the same as in picking fruit, so that nails and boots do not injure the trees. Pruning is a delicate operation at best. Some people think the more you cut off the better the trees get along, and that they will stand any kind of cutting. Trees should not be cut nearly as much as we do cut them. Nature's way of pruning them shows how careful we should be of these delicate structures.

Mr. Demill : Explain the term "sun-scald."

Mr. Hutt : I do not know that I can explain it, except simply that we have the effect on the tree, where the bark shows dead on the outside portion. It seems to be

dark quite a way in, and when it becomes old it comes off and has a scurfy appearance. It is supposed to be from too much sunlight on the tree, that simply burns it.

Mr. Boulter : Or in winter time when the sap is going up and down and freezing ?

Mr. Hutt : I think it is usually from the sun burning the tree.

Prof. Van Deman : That is one of the most difficult things that I have had to deal with yet, one of the hardest things to understand, and really I confess that I know very little about it now, after all the years that I have been watching it. I very much doubt that the sap actually is heated or the delicate parts are heated to such a degree by the sun's rays that the cells are killed; but sometimes we have in the winter time an action of the sun in thawing out the tree on one side, while the other part is frozen, and we have cracks made by this difference in the tension of the internal parts of the tree that opens the seam. It cannot be but very small, so that it can hardly be noticed, and evaporation may take place then, but there is a rent in the bark or in the wood sometimes which occurs, and then other injuries may result from that.

Mr. Demill : In time it will kill the tree ?

Prof. Van Deman : It will hurt the tree, and sometimes kill it. I have seen trees that were actually split open so that I could see right through ; but when we come down to the strict term sun-scald, I doubt very much if the sun ever actually cooks the living parts of the tree. In pruning the tree I think we ought to be careful not to lay back the branches of the body of the tree in such a way that the sun does shine upon it in an unnatural way.

Mr. Boulter : Did you ever see sun-scald in a tree where the suckers are growing up around it ?

Prof. Van Deman : No, sir; not apt to be, because these rapid changes do not take place, they cannot take place, because the temperature is kept quite even.

Mr. Boulter : Did you ever see it affected if it were protected by a board put down on the south side of the tree ?

Mr. Van Deman : I have seen them protected in that way. In Wisconsin they do that to keep off these winter suns, because, though the sun does not get hot enough to cook the sap, there is an inequality. In a forest usually if a tree stands out by itself the limbs grow down so horizontally that they protect the tree so that the body very rarely comes in contact with the sun's rays, and there is where the wood grows the best. It wants to be kept of an even temperature.

Prof. Waugh : Mr. Boulter's question starts me off. He asks if we ever see sun-scald where the suckers begin ; but I find usually suckers on a tree that has sun-scald. The sun-scald brings on the suckers. As to the cause of this sun-scald we have observed it very attentively, and it is a great difficulty to some of my trees and methods of pruning, and after having observed this closely and on the information of others for a number of years, I feel very much that the sun-scald, as we call it, always takes place in the winter time. It is not a summer difficulty at all, it is a winter difficulty, and you find it worse in the places where the winters are severe, and the statement of the cause which is somewhere near the truth is this : that the sun comes on pretty hot during the afternoon in a certain part of the winter, and it is very warm on that side of the tree. I have seen some figures of a thermometer, but I would not dare to quote them from memory; the thermometer comes very high, then it may go down to 15 or 20 degrees below zero during the night. That tree is thawed out fifty or sixty times during the winter, and the sap is thawed out, and then frozen during the night, and one cell is broken away from another, so that this tender cambium layer is broken to pieces, and in the spring when it should start to grow it is all dried out and it does not grow any more and it is dead. The frost-cracks of which Prof. Van Deman spoke are different. They do not bother us much as a practical thing in the orchard, but this sun-scald is a difficult thing, and the great remedy for it is to prune the trees down low and not expose the branches. Where the trunks must be exposed, a great deal of help can be got by putting up a board or something to prevent the sun striking the tree in that part of the day when the sun is warm.

Prof. Van Deman : I think Prof. Waugh has made it much more plain than I did, that it i's inequality of the temperatures that has caused this drying out and cracking ; and right there is one point that I feel like impressing upon you. It sometimes occurs that the germs of blight early in the spring get into these places and actual blight occurs.

Prof. Waugh : The germs of apple canker get in there much oftener.

Prof. Van Deman : Yes, that is a thing that is rather local in its character. This is the region, but westward there is very little apple canker. Any of these sporadic germs may get into this rent, into the living tissues of the wood and then spread, and do a great deal of damage which we really do not understand at all.

Mr. Thompson : Would not cedar bark be better than wood ?

Mr. Hutt : Yes, but I think the difficulty can be obviated a great deal by the way in which you trim. Keep the trees more or less protected. We always find that that difficulty happens in unprotected situations. I have not had much experience with it in Welland where my orchard is.

Col. Rogers : I think a great deal of difficulty is from very excessive pruning. I will give you an instance. In my ignorance I one time grafted a number of my trees and did not cut a great deal of the top off at first, very properly. These grafts took remarkably well, and put out a vigorous growth, and the second season the grafts were in a very satisfactory condition, so much so that I thought I must take off all the rest of the top. If I had done it gradually I might have got away with the difficulty, but I made too vigorous a pruning, and then I began to see a similar wound to what we consider the sun-scald down the side of the tree, and in my judgment that wound is very much brought about by the vigorous pruning. It is often done I think by the action of the borers in the limbs. I think there is something in the too sudden checking of the flow of sap up and down the tree that produces what we used to call sun-scald.

Mr. Hutt : There is no doubt that in very vigorous pruning we rather check the economy of the tree and put it out of its regular habit altogether.

Prof. Macoun : The question of sun-scald is very important to northern growers ; I do not think that in this district it is so important, but I think the more thoroughly it is discussed the better. We find it very troublesome in the Ottawa District, and all up the Ottawa River, and I presume it is the same in the northern parts of Ontario. We have imported from the Western States these tree protectors which they use out there, simply thin veneer, which they make 2½ ft. long. We train out trees very late, and we simply bend the veneer round the tree and fasten them with a wire or string, leaving an air space between the protector and the tree. The air space keeps the tree very much cooler than if it were paper or something bound round close to the tree. This protector stands out about an inch on each side of the tree, or more, and we find the effects very good indeed. Any of you who are living in northern Ontario, where you cannot get this veneer, can go to the woods and split the bark off birch trees and make protectors. I think if the subject were well understood the basket makers would make these protectors, as they could be made very cheaply. We get ours at a cent a piece.

Prof. Van Deman : They cost $3 a thousand, ten or twenty inches wide.

Col. Rogers : I can suggest a remedy that would be cheaper with most of us, and that is tar paper. To prevent the action of mice in my orchards I take a piece of tar paper and roll it around a broom handle, in two feet squares, and it will keep its shape, and you could put that around the tree and tie a little string around it the first year, and it is, I think, the cheapest preventive of the depredations of mice I ever tried. The next spring you can gather up these rolls and use them over again for four or five seasons, and as the twist does not go out of them you do not need to tie them after the first time, as they will adhere to the tree, but not close enough to injure it all.

Prof. Macoun : Do you leave an air space ?

Col. Rogers : You do not repuire an air space during the winter season.

Mr. Caston : It is too bad to be interrupting Mr. Hutt in his interesting lecture, but this difficulty of sun-scald is very important to those who live in the northern districts, and I think Prof. Waugh has just hit the matter exactly. There has been a great

deal of discussion as to what caused those black streaks in the Northern Spy and Ben Davis, and some other commercial apples. I believe in these sections it occurs about the end of March or the beginning of April because we have a summer temperature on the southwest side of the tree just where the difficulty occurs; then the temperature goes down and we have a winter temperature at night, and when that occurs day after day at a time when the maple sap is flowing, the consequence is that the tissue on the southwestern part of the tree is destroyed, and we have a black streak from top to bottom. At the same time I believe some newly planted trees in the hot summer sun—because we have, to all intents and purposes, a tropical climate for several months—suffer from what is called sun-scald, and this will cause in some varieties a black streak. I think it should go out from this Association that it is very important, especially in the northern sections of this Province, that these trees should be protected, especially where the orchard stands with a southern or southwestern exposure. Where there is a northern exposure there is generally a cool wind blowing at that season that makes a great difference.

Mr. Shepherd : I think Prof. Waugh explains the difficulty very well. All the apple growers in the northern regions, where we have plenty of snow that lasts till nearly the end of April frequently, are quite well acquainted with the sun-scald, and in all the orchards that I visited in the Province of Quebec, the general practice is to branch the trees low. Our Fameuse is very much addicted to sun-scald. I had written a short paper on Quebec orchards to show you that the Fameuse in the Province of Quebec is our most profitable apple by a long way—we do not consider anything else comes near it—and notwithstanding what Mr. Caston had said we can prove that in the orchards where they have sprayed they have grown this year and for some years the finest Fameuse I have ever seen. Mr. Jack, my colleague, can tell you about that. His neighbor who did not spray this year lost actually two or three thousand dollars by not spraying.

The President : Mr. Hutt will please proceed with his very much interrupted address.

Mr. Hutt: This lighter-colored portion of the wood next the cambium is known as the sap wood. It is through this portion that the sap containing its dissolved mineral elements finds its way up to the leaves. In the leaf the watery part of the sap is evaporated, and the remainder, under the action of light, combines with the carbon-dioxide of the atmosphere, and returns downward through the cambium layer and is used up in growth. The circulation of sap is well illustrated in the practice of ringing grape vines. The sap passes up to the leaf through the sap wood of the cane, but being unable to return past the ring of dead cambium, it shows itself in early maturity and increased size of fruit. This darker central portion of the stem is the heartwood. It had once sap-carrying vessels like the sap-wood, but after working for some years the vessels have become plugged up, coloring matter has been deposited and that part of the stem has become dead tissue. From this time on the heart-wood plays no part in the life processes of the tree, except to give the trunk rigidity.

The situation of the root of a tree is the same as that of the trunk, in fact, the root may be considered as simply a branched extension of the trunk underground. Since the large roots are thickly covered with bark, which has already been described as an impervious waterproof covering, it is evident that little or no moisture is taken in by the large roots. This fact shows the mistake of applying manure, or fertilizers, near the collar of the tree. In order to facilitate the passage of water into the tree there are along all the small roots and fibres delicate structures, known as root-hairs. These hairs, by virtue of the small openings they contain, rapidly absorb the moisture from the soil. Root-hairs may best be seen in some seedling plant like a bean, but every tree has them in thousands. Like the cambium, root-hairs are so delicate that drying for a few minutes will kill them. It is the destruction of the root-hairs that makes successful transplantings so difficult. If trees could be taken from the nursery and be planted again without the loss of root-hairs, they would never know that they had been moved. This, however, is practically impossible, except with the smallest seedling trees, yet it shows that too great care cannot be exercised in protecting the

roots of trees during transplanting. It is owing to the heavy loss of fibrous roots, with their root-hairs, that it is so difficult, nay almost impossible, to transplant large trees. In taking them out of the soil most of the smaller roots with their absorbing root-hairs, are cut away, while the roots near the trunk which are left are covered with the thickest bark, and have little or no power of putting out root-hairs, or of absorbing moisture from the soil. As soon as the leaves come out on such a tree what sap there is in the tree is dried out and the tree dies. It is a good plan in transplanting large trees, or indeed any tree, to cut back the large roots the previous year, so as to cause the tree to send out nearer the trunk a strong growth of young roots, which will not be removed when the tree is dug up. You know how difficult it is to successfully transplant evergreens. Since they have always a maximum of foliage, and there root systems must necessarily be reduced in removing them from the nursery, the large top gives off moisture faster than the reduced roots can take it up, and so the tree dies. If we observe these things in transplanting trees we will have a good deal better success. All bruised and damaged portions of the root should be removed with a smooth, sloping cut. If trees are dried from exposure or delay in shipment the roots should be cut back to fresh living wood. When the cut surfaces are exposed to the moist soil the cambium grows over the end and forms a callus. This callus not being covered with a tough bark like the rest of the root, very readily gives rise to a vigorous root growth. For this reason, the rooting of layers can be hastened by nicking the bark and exposing the cambium to the soil, so that a callus is formed.

Since the root of the tree was reduced in transplanting we find it necessary likewise to reduce the top in a similar proportion. If this is not done and the season be a dry one, the trees have much lessened chances of surviving. All the foliage of the top is constantly giving off moisture, while the root has been reduced, consequently, we must reduce the top to form a kind of balance between top and root, and the tree is left more in the condition in which it was before it was removed from the nursery. But in reducing the top of the tree we must observe that the best developed buds are at the tips, and these are the ones that make the earliest growth in the spring. Consequently, we must not head back all the leaders, thereby removing the strongest buds, but we must leave one or two of the best leaders to start the growth early in the spring, and then thin out the lower branches.

As soon as the tree has established itself in the soil its energies should be directed to wood growth. The more foliage a tree has the more wood it is forming, consequently, young trees should be quite leafy, so as to get them to maturity early, for before a tree is mature it will not bear a great quantity of fruit. If the trees are whip-like they might be allowed, for the first year or so, to grow leafy right up the trunk. If, however, they are stocky trees the side buds may be removed and the whole energy directed towards forming the head.

A very important point about the orchard is the height at which the heads of the trees should stand. It used to be that low-headed trees were preferred, because they were less exposed to wind and the fruit was more easily picked. Of late years we find the best results can only be got by intensive cultivation, and as spraying has come to be a necessity and requires considerable driving through the orchard, the trees have to be somewhat higher than formerly. (Hear, hear.) If we have started the head of a tree at a certain height it will always be just at that height. For instance, if you start a main limb at five feet in a little tree, and that tree is living twenty years from now, that limb will be just five feet from the ground. After the head is started at any point, the trunk will not lengthen, but has growth only in thickness. All the growth in length in a tree takes place only at the bud or growing point. If we start trees too low they will always be too low.

Mr. Caston : As a matter of fact, there is not much danger in starting a tree too high. Most people head their trees too late, and they have to do heroic work afterwards in order to get cultivation amongst them.

Mr. Hutt: Yes, but that depends somewhat on the variety of the tree. Upright-growing varieties such as the Spy may be started lower than the Rhode Island Greening, which has a crooked, drooping growth. Trees should be started with not too many main limbs, for afterwards when the tree becomes mature it has become so thick that it is necessary to take out large limbs. In cutting out large limbs we make large wounds, which are a menace to the vigor and longevity of the tree. In all pruning the fact should be kept in mind that the leaves make nearly all the food used by the living cells of the tree. If large branches, with many leaves, are removed, the cells must undergo a corresponding process of starvation until new leaves are formed. The ideal pruning consists in removing not branches, but buds; not in checking growth but in directing it. It is easier, and also less shock to the tree, to pinch off buds here and there when the tree is young, than some years later to saw off large misplaced limbs. Trees should be so formed and shaped when young that in later years trimming will be only slight, and it will never be necessary to cut out a very large limb. Three, and at most four main limbs, make a nicely formed head, but they should not all be started at the same place in the trunk. The distance should be evenly divided and each large limb should have the whole trunk opposite it to brace against. Opposite and triplicate crotches should be avoided, particularly in peach and plum trees, for when heavily loaded the trunk is apt to be split down by the wind, and the tree is practically ruined.

Trees have naturally two methods of reproducing themselves—by buds and by the seeds of the fruit. Every bud on a tree is capable of reproducing that tree. Every bud of a tree is an individual; indeed, it is not the twig, or branch, or tree, but the bud that is the unit of plant development. Budding and grafting are only examples of vegetable reproduction by bud development. When a tree is growing rapidly and producing a good deal of wood and very little fruit, it is simply trying to reproduce itself by bud reproduction. On the other hand if a tree is fruiting heavily it is trying to reproduce itself by seed. The wood growth and fruit growth of a tree stand in a sort of counterpoise to each other. If a tree is growing vigorously it is not producing much fruit, and if much fruit, not much wood. Here is an example from a plum tree: This little twig (about 2 inches long) has taken ten years to grow, because the tree was busy producing fruit. This shoot (about 2 feet long), producing, as you see, a great many buds, grew in one year and did not raise any fruit. If we check the vegetative growth of a tree we cause it to form fruit; on the other hand, if we take the fruit off a tree before it is developed we stimulate wood growth. Vigorous pruning in summer, when the growth is in full swing will stimulate the production of fruit, but if the pruning is too vigorous the trees may be injured or even killed. I have seen pruning done in summer to stimulate fruit production have just the opposite effect, because it was not done intelligently. The pruner would thin the smaller limbs or go up the large limbs and take out every other branch. In this way many of the fruit-bearing branches were removed and wood growth still further stimulated. The correct method would have been to have headed back the most vigorously growing branches and not to have touched the smaller limbs on which the fruit would have been formed. As I said before, the reducing of the foliage of a tree limits its nutrition and more or less strikes at the vitality of the tree. Heavy pruning I would recommend only as a last resort. A safer method would be to stop cultivation, or to seed down with a cover crop, or the plow might be run a little deeper so as to cut off the surface-feeding roots and root-prune the tree. Pruning for vegetative, or wood growth, is that which has been outlined for the growing tree. Cut out all dead, broken and deformed limbs, and those which cross and rub one another. Care should be taken to keep the tree free from suckers, so that there is a free circulation of air through the tree, and the sunlight let in sufficiently to give the fruit a good color.

QUEBEC ORCHARDS.

By R. W. Shepherd, Como, Que.

I would like to speak to you to-day about our orchards in Quebec Province. Apple growing on the Island of Montreal is an old story—over 250 years old. There are large and extensive orchards to-day on the Island, but I fear they are not as flourishing as they were soon years ago, and, if the past season be taken as a sample, the orchards on the Island are scarcely profitable. Most of the owners of large orchards around the city are extensive market gardeners first, and apple growing takes second place. This, to my mind, is one of the chief reasons why the orchards are less profitable than formerly.

When there was no such thing as spotting, and fungous disease, it was no trouble for the owners of orchards near Montreal to grow the finest Fameuse in the world, but the market gardening orchardist is too busy in the spring with his vegetables and hot beds and does not find time to spray his trees thoroughly, and the result is poor and unprofitable fruit. There are more prosperous orchards to-day on the mainland, south and west of Montreal, because the owners give time and attention to the spraying and the care of their trees. The apple belt of the Province—i.e., where large commercial apple orchards are found—is limited to Montreal Island on the north and the counties directly south and southwest to the United States line and west, in the Ottawa Valley around the Shores of the Lake of Two Mountains. The principal variety cultivated is Fameuse, but McIntosh, Wealthy and some late keepers are being largely planted. The County of Rouville is a great apple growing county. On the slopes of the three superb mountains of that county, Beloeil, Rougemont and Yamaska, are some of the most productive orchards—principally Fameuse—in the Province. At St. Hilaire (Beloeil) are very large Fameuse orchards in fine condition, and the owners for several years having paid particular attention to spraying, have had large crops of fine fruit the past season. Some of the owners (in good years) realize five thousand dollars for their crop. In Huntingdon County there are some large orchards and in Chateauguay County some of the best and most flourishing orchards in the Province are to be found. In the Ottawa Valley—around the shores of the Lake of Two Mountains are some fine orchards—at Oka the Trappist Monks have large young orchards just coming into bearing, and a very extensive vineyard where grapes for wine are successfully grown. At Como on the south shore of the lake in Vaudreuil County my own orchards are situated. In this district the principal varieties cultivated are Fameuse, St. Lawrence, McIntosh, Wealthy, Golden Russet, Canada Red, Canada Baldwin and a few other late keeping varieties. But you will observe that in all these apple growing districts "La Fameuse" is the chief and most profitable variety of all the old French-Canadian varieties, and is the one and only variety which has survived, and after 250 years still holds first place, the old Pomme Grise, Bourassa and Revettes, being now rarely seen and not counted commercial varieties at all. Although we cannot grow commercially, the great variety of winter apples for which your Province is famous, yet those we do know attain a high color and good size. Our red apples are, perhaps, the reddest in the world. Our Fameuse and McIntosh cannot be surpassed for richness of coloring, and experience teaches us that rich red color is a commercial feature in exportable apples. Our apples are largely consumed at home and the city of Quebec takes a goodly share; some are exported to Newfoundland. The English market will take all the first quality of Fameuse we can send them, carefully selected and packed in boxes they give the highest satisfaction. As a rule the trees in the old orchards have been planted too close together, and this is most noticeable on the Island of Montreal, where it has been the custom to set the rows twenty-five feet apart and the trees 20 feet in the rows, and sometimes less than that. But in our new orchards the era of spraying has rectified this fault, and the distance apart which trees are planted is now pretty well understood to be not less than 30 feet each way. We have heard it said frequently that the Fameuse is dying out, but the largest growers of apples in our

Province do not believe that. More Fameuse are being planted out every year now than was the case in former years. Of course if spraying to prevent the spotting of the fruit had not been discovered, the growers of Fameuse would soon have become disheartened if they had many repetitions of the crop of 1897, for instance. But perseverance in thorough spraying, has convinced our growers that there is still money to be made out of growing Fameuse, and since we are able to export that variety in boxes, profitably, the demand for that apple is practically unlimited. As long as an apple is profitable to grow it will be grown, and because of its profitableness the Fameuse has survived for upwards of 250 years when other old varieties, equally popular, have long since practically passed out of existence.

The early French missionaries, the St. Sulpicians, were out in Montreal a long time before the Conquest, and they brought seeds from France and kept sowing the seeds, and at last was evolved La Fameuse, which is considered the best apple, as we grow it, in the world. (Hear, hear.) And I can tell you this, that the English market will take all the Fameuse we can send them, if we send it to them in good condition. I have had considerable experience in that, and I could read you letters that I have in my pocket, that I have received from persons without solicitation, that would convince you at once that they will take all they can get.

Col. Rogers : I heard you shipped some to the Prince of Wales, and received a letter.

Mr. Shepherd : The Prince of Wales has been getting apples from me since 1896. The King got Fameuse this year. (Applause.)

(Mr. Shepherd then read letters from Mr. Hugh Allan, of the Allan line, and Mr. Becket, the chairman of that line in Liverpool, who said, "They are the best apples I have ever seen from your side of the Atlantic. There are no bruises or moisture. If the Canadians could supply our Liverpool and London markets with some of those apples they would cut out apples of every kind as to color and flavor.")

Mr. Shepherd : I was going to suggest that we ought to have a joint convention at Ottawa. Some twelve or fifteen years ago we had a Dominion Convention. We want our Society and your Society to come together. There are broad questions to discuss such as the Fruit Marks Act, Transportation, Cold Storage, etc., which we are all interested in; and we would like to get our worthy friend from Prince Edward Island up here, and Nova Scotia people, and such a meeting ought to be arranged. We have our meeting at Coaticook on the 18th December, and I expect some delegates from your Society there.

Mr. Jack, Chateauguay Basin, Quebec: I expected Mr. Shepherd was going to do all the talking for Quebec when he started off, but I see he is going off to leave me to do a little. With him I would like to say I am very much pleased with the treatment we have received since we came here. I would like to put in a few remarks about our Association in Quebec. The other day when Mr. Jones was speaking about the Fruit Growers' Association he did not mention the opposition, as it were, we have to contend with in Quebec. You people in Ontario do not realize what we have to contend with there. In the first place we are divided from what is known as The Horticultural Society, which really started before ours ; ours was a branch from it. We did not consider that they were doing what we thought would be right, and we organized this branch society. I am a member of both. Then besides this opposition is the two languages. You do not realize what a great draw-back that is. It is extra expense in printing our reports, and a good many people do not talk French, and when they get to these meetings it is a hard thing as we have to hold meetings in the French section at least every two or three years, and it is difficult for the English speaking people to know what is going on. Our last summer meeting was held in River du Loup, and everything was talked or read in French. I understand French ; but there is a lack of interest. I have not been able to interest one Frenchman in spraying enough to do it thoroughly, although we have been having successful crops for at least ten years. Then another thing is climatic conditions. You people here think it is an easy thing to grow Spys, and you do not grow Kings to any great extent.

The President: O, yes.

Mr. Jack: We cannot grow Kings, or Spys, or Greenings, or American Baldwins. We have to select our hardiest varieties and grow them, which is another thing we have to contend with. Well, we are trying to interest our compatriots. Mr. Shepherd spoke about my neighbor who had lost so much. You know that after the blossoms drop there is a certain amount of dropping of the apples after a week or ten days, and my neighfor went through his orchard just at that time and saw a good many fallen apples, and the Fameuse are very deceptive as to the quantity on a tree, and he said, "I am not going to spray my orchard. It will cost me too much. It is not worth while." He came over and talked with me, and I advised him to spray, but it was no good. The result was that when he went to pick his apples this fall I do not think he got 5 per cent. of choice apples, and right over the fence in the orchard next to his I think we got 90 per cent. clear fruit from spraying. If his apples had been sprayed and cared for, there was nothing to hinder him from having a thousand barrels of choice fruit, and I estimate that he lost nearly five hundred barrels on account of not spraying, worth $2,000. He shook his apples down and turned his pigs into the orchard in a year like this—and that is a Scotchman, I am sorry to say—(laughter)—a man whom you would expect would understand these things. I think there are only about three men in Chateauguay who spray thoroughly enough to make it a success. Well, we are trying to interest those fellows in spraying and fruit growing, and I hope some time our Society will be just as massive and strong as this Association is. (Hear, hear and applause.) We spray three times, once before and twice after blossoming.

Mr. Harold Jones (Maitland): Mr. Jack need not feel discouraged in regard to the results of their work. I was never so much pleased with any meeting as I was with theirs in Huntingdon last year, knowing that it was their eighth annual meeting, and that their Society was practically in its babyhood compared with ours. The meeting showed as much interest and had as large an attendance and in every way was just as encouraging and enthusiastic as ours, and more so than ours was at Brantford last year, and our Association is forty-two years old. We have the Government at our back, we have the money and the men, and we could not gather the interest of Brant County around us. In Quebec they have a small grant and a few men, and they went into Huntingdon and got the most intense interest taken, and I think they should feel very hopeful of the results of their work.

FRUIT MARKS ACT.

By Prof. J. W. Robertson, Agricultural Commissioner, Ottawa.

The speaker prefaced his discussion of the subject by inviting his auditors to read the Act, copies of which were distributed through the hall. The Act and instructions read as follows:—

AN ACT TO PROVIDE FOR THE MARKING AND INSPECTION OF PACKAGES CONTAINING FRUIT FOR SALE.

(Assented to 23rd May, 1901.)

His Majesty, by and with the advice and consent of the Senate and House of Commons of Canada, enacts as follows:—

1. This Act may be cited as The Fruit Marks Act, 1901.

2. This Act shall come into operation on the first day of July, nineteen hundred and one.

3. In this Act, unless the context otherwise requires,—

(a.) The expression "closed package" means a box or barrel of which the contents cannot be seen or inspected when such package is closed;

(b.) The expression "fruit" shall not include wild fruit, nor cranberries, whether wild or cultivated.

4. Every person who, by himself or through the agency of another person, packs fruit in a closed package, intended for sale, shall cause the package to be marked in a plain and indelible manner, before it is taken from the premises where it is packed,—

(a.) with the initials of the Christian names, and the full surname and address of the packer ;

(b.) with the name of the variety or varieties ; and

(c.) with a designation of the grade of the fruit.

5. No person shall sell, or offer, expose or have in his possession for sale, any fruit packed in a closed package and intended for sale unless such package is marked as required by the next preceding section.

6. No person shall sell, or offer, expose or have in his possession for sale any fruit packed in a closed package, upon which package is marked any designation which represents such fruit as of finest, best or extra good quality, unless such fruit consist of well-grown specimens of one variety, sound, of nearly uniform size, of good color for the variety, of normal shape and not less than ninety per cent. free from scab, worm holes, bruises and other defects, and properly packed.

7. No person shall sell, or offer, expose or have in his possession for sale, any fruit packed in any package in which the faced or shown surface gives a false representation of the contents of such package ; and it shall be considered a false representation when more than fifteen per cent. of such fruit is substantially smaller in size than, or inferior in grade to, or different in variety from, the faced or shown surface of such package.

8. Every person who, by himself or through the agency of another person, violates any of the provisions of this Act shall, for each offence, upon summary conviction, be liable to a fine not exceeding one dollar and not less than twenty-five cents for each package which is packed, sold, offered, exposed or had in possession for sale contrary to the provisions of this Act, together with the costs of prosecution ; and in default of payment of such fine and costs, shall be liable to imprisonment, with or without hard labour, for a term not exceeding one month, unless such fine and the costs of enforcing it are sooner paid.

9. Whenever any fruit packed in a closed package is found to be falsely marked, any inspector charged with the enforcement of this Act may efface such false marks and mark the words "falsely marked" in a plain and indelible manner on such package.

2. The inspector shall give notice by letter or telegram to the packer whose name is marked on the package before he marks the words "falsely marked" on such package.

10. Every person who wilfully alters, effaces or obliterates wholly or partially, or causes to be altered, effaced or obliterated. any inspector's marks on any package which has undergone inspection shall incur a penalty of forty dollars.

11. The person on whose behalf any fruit is packed, sold, offered or had in possession for sale, contrary to the provisions of the foregoing sections of this Act, shall be prima facie liable for the violation of this Act.

12. Any person charged with the enforcement of this Act may enter upon any premises to make any examination of any packages of fruit suspected of being falsely marked in violation of any of the provisions of this Act, whether such packages are on the premises of the owner, or on other premises, or in the possession of a railway or steamship company ; and any person who obstructs or refuses to permit the making of any such examination shall, upon summary conviction, be liable to a penalty not exceeding five hundred dollars and not less than twenty-five dollars, together with the costs of prosecution, and in default of payment of such penalty and costs, shall be liable to imprisonment, with or without hard labour, for a term not exceeding six months, unless the said penalty and costs of enforcing it are sooner paid.

13. In any complaint, information or conviction under this Act, the matter complained of may be declared, and shall be held to have arisen, within the meaning of

Part LVIII. of The Criminal Code, 1892, at the place where the fruit was packed, sold, offered, exposed or had in possession for sale.

14. No appeal shall lie from any conviction under this Act except to a superior, county, circuit or district court, or the court of the sessions of the peace having jurisdiction where the conviction was had; and such appeal shall be brought, notice of appeal in writing given, recognizance entered into, or deposit made within ten days after the date of conviction; and such trial shall be heard, tried, adjudicated upon and decided, without the intervention of a jury, at such time and place as the court or judge hearing the trial appoints, within thirty days from the date of conviction, unless the said court or judge extends the time for hearing and decision beyond such thirty days; and in all other respects not provided for in this Act the procedure under Part LVIII. of The Criminal Code, 1892, shall, so far as applicable, apply.

15. Any pecuniary penalty imposed under this Act shall, when recovered, be payable one-half to the informant or complainant and the other half to His Majesty.

16. The Governor in Council may make such regulations as he considers necessary in order to secure the efficient enforcement and operation of this Act ; and may by such regulations impose penalties not exceeding fifty dollars on any person offending against them ; and the regulations so made shall be in force from the date of their publication in The Canada Gazette or from such other date as is specified in the proclamation in that behalf; and the violation of any such regulation shall be deemed an offence against this Act and punishable as such.

PRIVY COUNCIL, CANADA.

At the Government House at Ottawa,

The 14th day of September, 1901.

Present : His Excellency the Governor-General in Council.

Whereas by Section 16 of the Act 1, Edward VII., Chapter 27, intituled "An Act to provide for the Marking and Inspection of packages containing Fruit for Sale," it is provided as follows :—

"16. The Governor in Council may make such regulations as he considers necessary in order to secure the efficient enforcement and operation of this Act; and may by "such regulations impose penalties not exceeding fifty dollars on any person offending "against them; and the regulations so made shall be in force from the date of their "publication in the Canada Gazette or from such other date as is specified in the procla- "mation in that behalf; and the violation of any such regulation shall be deemed an "offence against this Act and punishable as such."

Therefore His Excellency the Governor-General in Council is pleased, in virtue of the above cited provisions of the said Act, to make the following regulations, the same to come into force on the date of their publication in the Canada Gazette :

1. The Minister of Agriculture may make appointments of inspectors and other persons for the enforcement of the Act.

2. Any inspector charged with the enforcement of the Act may detain, for the time necessary to complete his inspection, any shipment of fruit, in respect of which he has reasonable grounds for believing that the marking of the package or the packing of the fruit constitutes a violation of the Act; such fruit shall at all times be at the risk and charges of the owner thereof ; and any inspector detaining fruit shall give the owner, where ascertained, notice that such fruit is being detained, in storage or otherwise, as the case may be.

3. The despatch of a prepaid telegram or letter to the packer whose name is marked on the package shall be considered due notice.

4. No person shall, for himself or on behalf of any other person pack any fruit for sale, contrary to the provisions of the Act.

5. Any inspector or other person who violates any of the regulations made under the authority of the Act shall for each offence on summary conviction be liable to a fine of not less than five dollars, and not exceeding fifty dollars, together with the costs of prosecution.

(Signed) JOHN J. McGEE,

Clerk of the Privy Council.

FRUIT MARK'S ACT, 1901.

General Instructions.

1. Inspectors will visit orchards and packing houses to give information with regard to the Act. They will keep notes of what they observe during such visits.

2. Inspectors will examine fruit at all points in the district assigned them, whether at shipping stations, packing houses, orchards or elsewhere, as directed and as opportunity offers.

3. The Act does not provide for the inspection of particular lots of fruit at the request of buyers or sellers. When not under specific directions, inspectors will use their discretion as to where they can best employ their time within the district assigned them.

4. Inspectors will avoid anything which would delay unnecessarily the movement of the fruit, or which would interfere with the interests of those concerned in the fruit trade, except in so far as action may be necessary to prevent violation of the Act.

5. Packages which have been inspected are to be closed by the inspector and left in marketable order after examination, unless the owner prefers to take charge of such opened packages.

6. Inspectors will report to the Department by telegram regarding any particular shipments which in their judgment should be examined at the port of export or elsewhere.

Explanations for Guidance of Inspectors.

Sec. 3 (a.) "Closed Package" apples only to boxes or barrels.

Baskets even with close covers will not be considered closed packages to be affected by Sections 4 and 6 ; the packing of fruit in any package is subect to the provisions of Section 7.

Sec. 4. The words "plain and indelible manner" are to be taken as including all forms of marking which are plain and not readily rubbed out or removed.

Sec. 6. "Finest, best, or extra good quality." The following marks also are held by the trade generally to indicate this quality of fruit : "XXX," "Choice," "A. No. 1," "No. 1," "Fancy," "Selected," "Prime."

"Nearly Uniform" is to be taken as including any size of fruit except that which may be fairly classed as small for the variety.

"Bruises." Only such injuries as produce decay or otherwise materially lessen the value of the fruit for consumption, should be counted as bruises.

"Scab." Such as causes appreciable waste is to be considered particularly.

"Properly Packed." "Slacks" are to be considered as not properly packed if the condition is likely to result in permanent damage during handling or transit.

Sec. 9, "Falsely Marked." In case no marks appear, the inspector will ascertain who owns the fruit, and report to the Department. If marks are incomplete under Section 4, the shipper is to be notified of the requirements of the Act.

"Notice." After notice there need be no delay in carrying out the further provisions of the Act.

In case no name appears on packages, proceedings may be taken against the owner where ascertained; otherwise against the party in whose possession the fruit is found.

Sec. 11. In case of sales on commission the real owner will be first held responsible, but the commission merchants, who, after notice, handles fruit put up contrary to the provisions of the Act, will be proceeded against.

Sec. 12. If objection is made to entry or inspection the inspector must give written notice of his authority under the Act to the party objecting, enclosing a copy of the Act.

JAS. W. ROBERTSON,
Commissioner of Agriculture and Dairying.

Department of Agriculture,
Ottawa, September 18, 1901.

Prof. Robertson: The Fruit Marks Act happens to come under the care of my branch of the Department for administration. We have now ten inspectors, and one or two more to appoint in some of the more distant parts of Canada. The purpose of the Act as proclaimed in Parliament, and since then, was first of all educational. So far the work has hardly been educational; it has been rather what I would call informational. There is quite a difference in life, I find, between acquiring information and imparting education. Inspectors have been chiefly employed in going to orchards and packing-houses and at the shipboard, giving the men who handle, free information on the Act itself and all methods of packing that have been found profitable and safe. The three inspectors in Montreal, and now there is a fourth in the Province of Quebec, have examined altogether 254 shipments. That is a considerable number, comprising over 33,000 barrels. On the whole, these men report that the packing this year is better in regard to what I shall call fairness of placing the fruit than it has been hitherto; but there is room for very, very great improvement in that respect yet. There have been no prosecutions, because the inspectors had instructions that they should confine themselves at first to giving information, and when a parcel of fruit was found to be wrongfully marked or falsely packed, to inform and warn at once the man whose name was on the barrel. That has been done. I have a record of the letters written to every man on that subject. Now, in many cases, after the first warning was given there was fair reason why a prosecution should follow, but the instructions were at first to follow that course. Sometimes the stamp "falsely marked" was not put on the barrels until the shipper whose name was there had been warned, and then the stamp went on, not on every barrel in the lot, but on every barrel examined and found falsely marked. I need not explain that further; I think you see what we are trying to do. I will read you a letter that came in recently like some others. This is dated on November 23rd from Aberdeen, Scotland, where those people live who are said to have been the Ten Lost Tribes, and who improve on the Jews' ability to make money. (Laughter):

"We have just received delivery of two parcels of aplcs ex the Allan Line steamship Sardinian by Glasgow. They are as follows:" (I will not put the names of the men here now, we are not more than ready for that, but after this week the names will go broadcast. We said till the close of navigation we would simply be informational, but we have a duty, to carry out the will of Parliament, then there is to be an enforcement of the Act.) "These were bought on a guarantee of being equal to our highest requirements. Well, we see a large quantity marked in red letters 'falsely marked.'" (That man had been warned before, and the "falsely marked" went on his barrels.) "Now what did your inspection of these two lots reveal? We also have examined some not marked thus"—(those were the ones on our records that were found the first time and the man written to, but not the stamp put on his barrels)—"and found them headed top and bottom with good fruit, while in the centre they were like eggs. Please reply quickly. This style of packing is a perfect scandal."

"We get many letters like that, I am sorry to say. The inspectors have been giving information. They have been carrying out the instructions of the Department; and the instructions of the Department to the inspectors from this day forward are that they should enforce that Act, if need be, collect evidence to follow up by prosecutions. I have no option. Parliament passed the law, the Department directed me to see that it was enforced, and that there was information given till the close of navigation, and now I want to have this said for the convention and the public through the press, that the instructions to the inspectors are to collect evidence and to enforce the Act, and then if the Act is found to be a wrong one or a bad one, Parliament can deal with it. Many of the inspectors are here; I thought it desirable to have them here for the information of the fruit growers and others. There are, first of all, three requirements regarding marks. The package shall have the name of the packer; shall have the name of the variety or varieties, and shall have the designation of the grade of the fruit. Some men have put on the letter "D" four times. Now, what that designates I do not know. It seems evident that there should be, in the interests of the shippers and the growers alike, some designation that is clear, that is correct in regard to definition, and has a

marketable and market value, a commercial use. Now, I do not say this as a recommendation, but it seems a desirable thing that we should make provision, by recommendation or otherwise, for at least this, that all apples packed in closed packages coming under the scope of this Act should have one of two things on them—either No. 1, No. 2, or No. 3, as one option, or XXX, XX, and X. Shippers are in the habit of branding either by figures 1 or 2, or of branding by X. Now, there can be no objection to a man putting on XXX if he wants to, if that will be better than No. 3. It seems to me desirable, as my personal opinion, that there should be another regulation, that that designation should have either one of those things, either have 1, 2 and 3, or X, XX, and XXX, to indicate the quality; and then if a man wants to supplement that by any other designation he likes, such as "selected," "choice," or "fancy," there could be no objection to that. Then if those apples are marked No. 1, and come up to the definition within the Act, they would go forward without any trouble and be accepted on the other side. One observation more. The designation of grade, I think, should also make provision for this. A good many apples are packed in orchards and intended to be repacked before they are shipped. For such fruit on the way from the orchard to a packing house or store, it ought to be sufficient to allow the words on "for repacking" ; that would take the place of a designation of grade until the fruit was repacked and properly sent out. In the packing itself there is the common way of having the fillers, and the followers and the facers. I have no opinion to offer in regard to the methods of packing, if they can be both in fact and in intention honest and honorable. If I were packing apples I would see no objection myself to putting the nicest looking apples on the face of the barrel. I say that, knowing I am saying it for the public, if you will—I would put the nicest looking apples on the ends of the barrel. That is Nature's way. You know what Drummond says, that "The Lord put the bloom on a woman's cheek for the perpetuation of the race." (Laughter.) It is best to have the nice side put upwards in every kind of face. Now even in the facing of barrels, as you know, a barrel does not look any better if it is faced with all large apples than if it has larger apples in the middle and medium or rather smaller towards the edge. That is a proper barrel face for shipment or for any other sale. I do not say—and I want to say this in explanation—that all apples must be perfect specimens. If the law required that all apples to be graded No. 1 should be all perfect specimens, then the law would require an impossibility in regard to profitable fruit growing—(hear, hear)—because if you take an ordinary well-conducted orchard, I think a man would have a high percentage if he had 10 per cent. in average years off any tree of perfect specimens—10 per cent that are faultless in form, that are perfect in color, that are true to shape, and are all the rest of it right. How much of a crop of any tree could you get for the Paris Exposition—perfect specimens ? At the same time, if you have marketable fruit, it is good fruit, first-rate fruit, but not perfect in regard to these definitions. Then perhaps the other 2-10 of the crop—that would make 3-10 altogether—would be first-class high grade fruit ; and then still more fruit would be of sound, useful, commercial quality ; so I think 4-5 of the fruit in an average year on any tree that has been sprayed properly and well nourished and well cared for might be what you might even call No. 1 fruit ; but that should go into a barrel as it was on the tree. I do not remember that I ever saw a tree where you would find fruit on one corner. It seems that Nature spreads the fine fruit all about, and some not so good close by, and if it is like that barrel, with all the pretty apples on the face, it should not be charged against us as a nation in this matter, and I think there would be far more profit come to you as a people. (Hear, hear.) My inspectors and myself had some mail sent on here, and one letter came from Glasgow this morning saying that they had found that the apples in boxes for the Exhibition had kept ever so much better than the similar apples for the same Exposition kept in barrels—so they had apples at the Exhibition when it closed, for thirteen months in boxes, that had kept first-rate, but the apples in the barrels of the same sort had very largely decayed. Now, even for safety of carriage a box seems better than a barrel, and certainly for distribution all over the country through, a box will be a better package for the household. It will help our trade a good deal to do that. I have given the

inspectors perfect liberty to give you every information in regard to what they have found in their work. They are here not to offer opinions on the Act—that is the only limitation I have put on their own lips or mine—that the Act is the product of Parliament, and whatever you men, the free and unbiased electors of this country, may say about it, we men, who are charged with its administration, may not have any opinions to express, and if anyone thinks the action of the Department the next three months is rather harsh, well, we are the instruments and the obedient servants of Parliament to enforce that Act, and rightly or wrongly, as you may think, in regard to the fruit trade we are going to obey our instructions, and then when Parliament meets, if the country thinks the Act is wrong you can correct it in Parliament. I said to the inspectors, "Donot express any opinion about the Act, but give any information you wish about the inspection." I am greatly hopeful in the last two or three years, from attending conventions like this and others, that we will have lectures like Mr. Hutt's and Prof. Waugh's and others—I single them out as being the very kind of thing that every school boy and school girl will get in their days—(hear, hear)—then how wisely and well they will be brought up to make this a great country in every sense.

Mr. George Fisher : Were those closed or ventilated cases that were better than the barrels ?

Prof. Saunders : They were open.

Mr. Demill : I happened to be there; I was with the Commissioner, and I saw him open some of the cases, and they were ventilated cases in Paris .

Mr. Eben James: Regarding the Fruit Marks Act, I would like to ask Prof. Robertson what objection could be made to using the word "straight grade." At the opening of the season a great many of my clients and others held a little conference and wanted to know what terms could be used, because in picking apples in the orchard, especially where you cannot get the best of help and experience, you often take what you might call tree run ; you do not put in anything very bad, at the same time ones and twos are mixed up, and it would be a great injury to the shipper to call them No. 2, and they could not be strictly called No. 1, and so we adopted the word, "straight grade," and that has been going on until one of the inspectors refused one of my shipments, saying that they had ceased to consider the term "straight grade." I happen to be the lucky man that was referred to in the letter from Aberdeen. I know it, because the party told me he had written Prof. Robertson about it. There are two sides to that question. Those people I ship apples to in Aberdeen are people of comparatively poor standing, and I do not ship them any apples unless I get an advance on them, because when the market goes a little bit down they refuse the draft, and if it is up they threaten to sue me if I do not fill the bill. The man who shipped the apples is W. R. Stanley of Logan. The quality has been good right through. In proof of that, I sold three cars to Winnipeg, and the man wanted more at higher prices than I sold to this Aberdonian. Some apples are shipped forward on commission at Liverpool, and I can show catalogues where they sold from 22 to 28s. Now, if there was such fraudulent packing they would not sell that well. Those people have accepted all the drafts, even those that they did not have deposits against, and are wiring for more. Of course they wrote me the other day, and said they wanted me to make a claim on the shipper, and they were claiming £80 damages, or something of that kind, on a possible profit that I was getting of 25 cents a barrel, and that is the class of men who write. While the inspectors are good fellows and are doing their duty as well as they know how, there is a good deal of unfair shipping. I know hundreds of cars that those people have shipped via Portland that have never been examined and have been branded Double Extra, XXX, and everything else, and the sales on the other side have only gone to prove that the stuff was not packed right ; and here is a loyal people who want to patronize Canadian steamers and everything Canadian, we have got an army of men watching what goes via Montreal, while the fellow that ships by American ports goes Scot free. I have been hit several times, and I feel very keenly about it. There is another case that I wish to submit where I think I am right, and the inspectors are wrong. He says, "We took the shipper's name of those that were

marked falsely packed." I immediately instructed them to withdraw them from sale, because we would lose a dollar a barrel for a brand that had been put on a few. (Reading.) "We took the shipper's name of those marked 'falsely packed,' but they, the inspectors, exceeded their authority under the Act by marking some of them 'falsely packed,' as the packing in all instances seemed, even when the barrels were taken out, to be perfectly honest. In such a case, surely 'not up to standard' would have been a better designation, as all we could find wrong was that the fruit was slightly mouldy. Surely this has nothing to do with the packing. We drew the Government man's attention to this here, and he agreed with us." Where do we come in with a case of that kind ? Under the Act, I suppose, we are just as liable to be fined a dollar a barrel and jumped on when it is not our mistake. As a matter of fact, the Government man was with us on the other side, but I suppose it is as much as his job was worth if he would oppose the inspectors on this side. What protection have we got against this ? And yet we put out our hard money in this country and try to get it back. We have got to have some protection and some fairness. There is another part of it. One of my shippers, Henry Tuthill, of Thornbury, one of the oldest and most independent shippers of Canada—he and D. L. Simmons the pioneer shipper of this country—these gentlemen joined their interests this year and shipped for us under their own brand, and they have got two very well established brands in England. Mr. Simmons' apples have gone on under the D.L.S. brand, and one man shipped to Watkins of Liverpool and the other shipped to Adams, and they divide the cars equally and keep from beating down prices, and they know very well we are packing again, and will send home most of the money and get the business, and they divide the cars equally as far as they are able. Now, ever since Simmons has been in business, Talman Sweets have been shipped as Golden Pippins, and they are known to the buyers in England as Golden Pippins. Well, this year Farwell & Saxon shipped, as they always have done, and his Golden Pippins were marked "falsely branded" in Montreal, and the other fellows had gone Scot free. Now, why that discrimination ? I should like to know why one man's stuff should be let go free as packed all right, and the other man is jumped on ? So, what was the result ? For the time being that they were shipping these Golden Pippins they put them on under the brand of D.L.S., and there was nothing heard about them and everything was smooth. (Applause.)

Prof. Robertson : Of course I am not going to have any discussion. I have nothing to offer of an opinion except this, that the report of our inspectors on the apples shipped under the name of Stanley, of Logan, says it was the second offence, and the apples were as bad as described in that letter. The apples were badly packed, falsely packed, and we will stop that in Canada if we can. (Hear, hear, and applause.) The inspectors so far have been collecting evidence, and they always got the testimony in Montreal of three independent men. Their salaries are not at stake; their positions are at no risk ; and anyone who thinks that a Government official is liable to be cashiered unless he chimes in with the trend of public opinion is mistaken. Our men are not built that way. We have the independence of doing right, and we are going to do it, and you commercial men who are in the business for a speculative purpose have done it serious harm in past years by sending fruit that has been complained of everywhere, which I myself know, for I saw this thing in that country and this. We should do the business honestly, or else stop the business and let others who will do it. (Hear, hear.) My chief in this matter is Mr. W. A. McKinnon, who is appointed specially to administer this Act with these inspectors, and we hope to administer the Act with a spirit of fairness, without any regard at all to any extraneous matter except the honest packing and the honest marking of Canadian fruit.

Mr. Eben James : May I ask if Talman Sweets can be shipped as Golden Pippins ?

Prof. Robertson : Quite a common thing ; that variety is known under both terms.

Mr. Eben James : I am glad the inspectors are here, because they will know it. Another thing, I just appeal to the public in this respect ; we have handled this year close on 40,000 barrels on various cars, and one man is packing several thousand barrels

Now I proved by my catalogue that these Stanley apples were packed in the very best way. We all want the apples packed right, and so does Stanley and everybody, but how can you get it all done right ? There is always some barrel that will go shy in finishing up, and what was perhaps packed as a barrel of Spys, if they need a peck to fill up and put in something else, all these things come up against the law and hard facts, and it is very hard to interpret on the packer who is packing in an individual orchard, and in nine cases out of ten the strength of the chain is the weakest link, and they pick cn a barrel of apples that is finishing up; but they only found in that lot seven or eight barrels that were marked "falsely branded," and the apples went through in good shape. In shipping apples from the storage anybody knows that there is no danger, because you have lots of apples to work on, and you can grade up, but in the orchard, packing in the fall is a very hard matter, and there is always an occasional barrel that will go through. We have no desire to be dishonest, because we buy the apples by the barrel in many cases, and it is no interest to the shipper to ship poor stuff, but it is to the best interest of all concerned to pack honestly. Anyone knows that a man who is an A1 man is not looking for a job for three months of the year, he is not looking for a job to go about among rain and wet and pack apples in the fall, and the C. P. R. excursions were and inducement to men to go to the west, and there is a dearth of farm labourers from one end of the year to the other, and we have to employ all manner of labor, and the law must be lenient with us. We are men who are putting up our good hard money. If we are molested we will have to seek other fields, where we will not be molested. I understand the word "straight grade" we can use ?

Prof. Robertson : So far, until the law is changed or amended, the law lets us accept any designation of grade.

Mr. Eben James : Then the inspector was in error ?

Prof. Robertson : I think one thing I did not make clear, that there was no such intention or practice as taking any action on a single barrel in a lot, but if any one barrel is found to be wrong or bad the inspector goes on and finds more. If he finds more he brands only those he finds. Now in one of these cases there were eleven barrels examined, and they were all found bad, and in another case there were 7 examined and 6 bad. I am sorry if the inspectors should be so accidental in hitting on these bad barrels.

Mr. E. D. Smith : When he examined those barrels and found them bad, would not the inspector go on and examine all the rest of that man's shipment ?

Prof. Robertson : He would in case of prosecution, but this year for the sake of information they did not examine the whole lot. I have every sympathy, and we all have, with the difficulties of this business, but we want to begin to stop some of them. at least such as come under the eye of the inspectors. I have been told a thousand times the last two weeks, "That is very well; you got the Act passed at the request of the Fruit Growers' Association, Parliament gave you power, and you have been putting up a huge game of bluff this year." I like to play bluff, but I like to "call" occasionally—(laughter)—and I am going to call. (Applause.)

Mr. R. J. Graham (Belleville) : I think the Fruit Marks Act is all right if it went a little bit further. If we could have the fruit inspected at the point of shipment and a certificate from the inspector that the fruit is No. 1, or No. 2, or No. 3, as the case might be, it would materially help us in our export trade, because then there would be no chance for kicking at the other end of the line. I think that we who are in the export trade could very well afford to pay for having the apples inspected, a reasonable amount, $5 or $10, or $20, a car. I know, for my part, I would prefer to do that, and if I sold a car of apples as No. 1 Standard and got a Government certificate for it, my responsibility for that fruit would cease, and it would settle all this dispute between the Aberdeen man and the man this side, and there would be a finish to it; but unfortunately the Fruit Marks Act, as I understand it, does not permit the giving of certificates of that kind by the inspectors, and therefore we cannot sell with a certificate of inspection. I think it is a capital plan to have this fruit inspected, and those who are

at fault should pay the penalty. I understand the difficulties of the situation somewhat, having some 60 or 70 men packing apples for me this fall. I felt that I was responsible for their work, and, although I was not able to see what they did, I could see that I must take a great deal of responsibility in employing men of that class. You turn around and say, "Well, only employ men who are responsible and who would make good this loss;" but you know it is impossible to get 60 or 70 men to take charge of gangs, to pack apples in an orchard, that would put up for any loss; they could not do it ; they would not do it, and the result is the responsibility must come back on me. I feel that it is a serious thing to be responsible for that sort of thing, but I do not see any other way out of the difficulty. Of course apples that come out of the fruit house it is easy to be responsible for, because you can control that sort of thing ; you cannot grade up fruit in an orchard the same as you can in a fruit house, and in order to be safe at all you necessarily have to come back and grade all your fruit No. 2, and of course it is a difficult situation to be placed in. I do not know how the thing will work out, but if we could in some way have enough inspectors so that when a car is being loaded we could pay a reasonable amount to have that fruit inspected at the point of shipment, then our responsibility would cease, and we would have direct control of our subordinates who are packing our apples in our orchard, and we would get back on them before serious damage was done. (Hear, hear.)

Mr. Eben James : I got a letter some time ago about branding No. 2, and I understand from one of the inspectors that the question of branding No. 2 was to come up here while Prof. Robertson was present. The old saying is, "It is a poor thing to cry rotten herrings," and the dealers in the Old Country do not like apples marked No. 2—not but what they know the quality of the apples all right, for some apples No. 2 are better than apples No. 1; at the same time when an apple goes in branded No. 2 the dealer says, "That can't be much good, the man himself says it is only a second." Here is what they write :—"Referring to branding apples, we think you should tell your shippers not to brand anything you may call your No. 2—they are about as good as each other. No buyer wants a party's goods so described, and we do not think it is to the seller's advantage to advertise the inferiority of his goods, which it probably means. A circular for private circulation on these lines should be given." I will just say right here, if I go down to Maine and operate, or parts in Missouri, or any other part of the States, a man has not to put No. 2 on his apples; if his name is on and he fulfils the law by making the top a fair representation of the interior, I think that ought to be pretty near enough.

Prof. Robertson : Prosecutions that have been even threatened, and that likely will be taken by the inspectors, have never been on any such point as whether the designation of grade was a little bit too high or too low. It has been on that palpable and evident fraudulent practice of putting rubbish in the middle of the barrels which that letter complained of. That is the thing that we all want stopped. There is no intention or desire to put a hard interpretation on the law, that that thing is nearly No. 1, but not quite. There is no action taken on that, hardly even by writing letters; but it is this other evident, palpable fraud of putting stuff in the middle, and it is our intention to stop that. (Hear, hear.)

Mr. D. J. McKinnon: I have had some experience in shipping, and I think that the very fact of pledging every shipper to put his name in plain letters on a barrel is a sufficient guarantee to get over a great deal of the past difficulty from which a practice that many shippers have—and I am going to speak out plainly and say that that is the practice of a packer named here to-day—anything that he had very good he would put his own name on, but if they were No. 2, he says, "put up by Mac," or by Jack Somebodyelse. That is what we want to stop. (Laughter.) Everything that goes to Liverpool I put my own name on in full, and if everybody else had done that we would not have had the trouble.

Mr. A. E. Sherrington (Walkerton) : Suppose a gentleman buys apples and he employs a man in another section operating for him, and he sends a man on to pack, even cautions the man by letter to be careful in packing under the eye of the operator. He re-

tains those letters in his pocket, instructing the packers to go on and put up apples that are not right, and those apples are not put up honestly. Who is to suffer for it ? Why not the operator or the packer ? And how are you going to get at him ? He is not worth anything. The only way is, you will have to imprison him to get satisfaction out of him. I know a case of that kind in our section. The man was in a terrible way, expecting to be prosecuted for this fruit that went out. I feel positive they were not put up right, because I know the man, and he is not capable of doing anything that is right. There is the difficulty—one man will suffer for another man's fault.

Mr. W. A. McKinnon (Chief Inspector) : I should be very glad to answer any questions or give any information as to the working of this Act, and our inspectors who are present will be able to give much more definite information regarding their experiences in various parts of the country. I may say that several objections have been met with in different parts to the various provisions of the law. If we took them in order we would find the first fault with that provision requiring the name and address of the packer to go on every barrel. If the packer has been used to shipping his first-class fruit under his own name, and has thereby obtained a market for that fruit which he does not wish to injure by shipping his second grade under that same name, it is a possible solution that he might mark the second grade so conspicuously, either No. 2, or if that is found dangerous, with XX.; he might mark it so conspicuously that no person would be misled into thinking that he was buying the old reliable No. 1 brand. Just in that connection, I would mention that I have looked through some account sales of this present year, and observed particularly the result where fruit was marked No. 2, and where fruit of the same variety sold at the same time and coming from the same part of the country was marked with XX, and I found that as a rule there is absolutely no difference in price, therefore I do not think it is always the experience that marking No. 2 fruit in plain figures is an injury. If XX, or if a pair of crossed flags, or if anything else is understood by the buyer to mean No. 2, what is the difference ? I cannot see. With regard to Sec. 4 (c) requiring a designation of the grade we have met the objection which I think Mr. James has stated this morning, that it is hardly fair, and is an infringement to the personal liberty of the grower, if he is not allowed to put his product, whatever it may be, on the market to sell on its merits, therefore the shipper would rather sell a second grade. I notice there is no objection to calling No. 1 by the best name possible, but a second grade he would like to sell only on its face. Possibly there is something in that. That is for you gentlemen to discuss. I will only say it appears to me that the second grade will do just as well if it is described on the barrel as if it has to be ascertained by a complete search through the barrel, and that a great deal of time and trouble would be saved if there were on the outside of every package a clear indication which would show what was within the package. With regard to section 6, and which describes the regulations for fruit that is declared to be the finest, the best, etc., we have two objections : first, that the standard set is too high in requiring 90 per cent. to be free from blemish. That objection we find chiefly in Ontario. The other objection is that 90 per cent. is quite too low a standard required for No. 1 Canadian fruit; that objection we meet in Nova Scotia. In regard to Sec. 7, which has most to do with the packing, there is a good deal of objection expressed in various ways, sometimes more frank than others. A good many say that there are purchasers, whether in this country, in the west, or in Chicago, or in England, who demand a face which will be somewhat superior to the bulk of the package Now it is for us all to consider perhaps why they wish a better face than the contents will warrant. It may be that if the ultimate purchasers, the consumers, were consulted, they would not ask for that same method of facing up the fruit. One letter has been read this morning with regard to some fruit which is alleged to have been branded "falsely packed." Now I do not mean to indulge in any hard speaking, but it is a fact that none of our inspectors have authority to mark a package "falsely packed," and I think it is absolutely true that no inspector has ever marked a package "falsely packed.' The authority conferred by the Act only extends to fruit which is falsely marked. In this very letter the writer takes exception to the brand "falsely

packed," which may or may not have been correctly reported, and says that the package should have been described as not up to standard. Now you will observe that there is not a very great difference between "not up to standard" and "falsely marked." Falsely marked, means that fruit which was marked of finest quality was not of finest quality, and therefore was not up to standard ; therefore it seems to me that our inspectors have been acting in accordance with the writer of this letter. The question has been asked where we are to get experts to pack fruit in accordance with the requirements of this Act. It appears to me that the solution may come to be that our farmers and growers will be the experts who will pack their fruit properly. (Hear, hear.) With reference to the designation "Straight grade" I may say that, having met this designation early in the season, I have taken occasion during the last two or three months to inquire everywhere where there were two or three fruit men gathered together what the meaning of that expression was, and I never yet found as many as two men, if there were only two, who agreed in their description of that word "straight." I think, therefore, it is at least a question whether the word "straight" is a designation of grade that will be recognized by the public generally. "Orchard run" is another designation which perhaps is more significant than "straight grade," but it is perhaps unnecessary for me to say that I agree very heartily with the suggestion that we should, if possible, eliminate some of the many designations which are used as designations of grade. Our inspectors at Montreal would perhaps be able to tell you some peculiar marks they have found on barrels. I think, if I remember rightly, there were at least fifty different expressions used to designate the grade of fruit in the barrel. Now for any trade that had to be conducted on a large scale it surely ought to be well to have a business-like, plain, English method of designating the quality of the fruit.

Mr. G. C. Caston: We expected that there would be a good deal of difficulty. These reforms are not accomplished without it, and when this Association grappled with the question two years ago and appointed a committee, I had the honour to be one of them, and there are several other gentlemen here who were on that committee—Mr. E. D. Smith, M.P., Mr. Woolverton, Mr. Fisher, Mr. A. H. Pettit, and others—we thought it was going to be a comparatively easy matter to frame a bill that would meet the case ; but when we met down there at Grimsby we wrestled with it a whole day, and we had not successfully grappled with it, because when we came to consider it, innumerable little details came up that were difficult to settle satisfactorily, and it will be some time before the thing gets into smooth working shape; but I think that one of grandest steps in our advance is, as Mr. D. J. McKinnon said, requiring every man to put his name on the package for sale. That should be enforced in every case. Whether it is No. 1 or No. 2, or I do not care how many filagrees he may put on the barrel, he should put his name on the package, whether it is for the home or the foreign market. I want to call attention to the fact that we are allowing a very important trade—perhaps we do not comprehend the importance of it within the whole Dominion, I mean the home market, the Western market, the Manitoba and Northwest—to slip through our fingers, and it is being taken by the people of the Western States, and from the Produce Exchange in Winnipeg we get the report that the apples sent there from Ontario, taken as a whole, are a disgrace to the Province, and the people of Washington and Oregon are taking that market from us. We should develop our Western markets for fruit among the people that are growing our hard wheat, for their money is as good as anybody else's. (Hear, hear.)

Mr. Eben James : We have heard a great deal about those seconds, but I have had an order from Winnipeg for No. 2 at $3 a barrel. We can market our No. 2 a year like this if we only pack them properly and face them up.

Mr. Boulter : You can mark it No. 2.

Mr. James : Of course you can.

REPORT OF COMMITTEE ON PACKAGES AND APPLIANCES FOR THE USE OF FRUIT GROWERS.

We, the Committee appointed to inspect and report upon exhibits of new appliances for the use of fruit growers, beg leave to report as follows :

We have examined the fruit grader invented and shown by Mr. A. H. Pettit of Grimsby, and in our opinion, judging from its simple construction, ease of operation, careful manipulation and the thorough manner in which it does its work, it is the best device for the purpose we have yet seen.

We have also examined the Expansive Tree Protector, and from its construction and easy adjustment to any tree we think it would be a desirable thing for the purpose, but not knowing the nature of the poisons used, whether they are attractive or repelling to insects, and not having seen it in operation, we are not prepared to say anything in regard to its real value as compared with burlap or other material. We would recommend that it be tried at our experiment stations and reported upon at our next meeting.

We also notice in connection with the well-known and excellent Spramotor, an improved Vermorel nozzle, which facilitates the cleaning of the nozzle, and also a hand valve which replaces the old stop cock.

The samples of fruit packages manufactured by the Ontario Fruit Basket Company have been examined and, in the opinion of the committee, their construction, lightness and apparent durability will make them a great improvement over the baskets formerly used. They also possess the advantage of being stitched with wire instead of being nailed, which makes them stronger. There is also a simple contrivance for fastening the cover without hooks.

(Signed) A. M. Smith.
J. E. Orr.
J. S. Scarff.

THE PROMISING NEW STRAWBERRIES.

By E. B. Stevenson, Jordan Station.

Some one has said, "doubtless the Almighty could have made a better berry than the strawberry, but it is certain he never did."

On account of the crowded state of our programme and the other very important subjects yet to be presented to the meeting I shall endeavor to be as brief as possible, omitting some things I might bring before you did time permit. I shall confine myself strictly to the subject given me, viz., "Promising New Strawberries."

I am pleased to say there are a number of them. There was a time when it was maintained by strawberry men that you could not get a staminate or perfect flowering variety that was as productive or as large as the pistillate varieties. It was held that the strain on the plant in producing the pollen weakened the plant, and the staminate variety for that reason could not produce as large berries, nor as many. We do not hear that now, because we have perfect flowering kinds that are producing as large crops of the finest berries as ever pistillate variety did. In fact, most of the kinds that are most widely grown for market at the present are staminate varieties. The promising new sorts are also of that kind.

The progressive grower is always on the lookout for something better than he has. One of the best new varieties is "August Luther." It was claimed for it that it was earlier than Michel's Early. It proved to be on my ground the past season, the only year I had it in fruiting. It was as follows : I planted "Michel's Early," "August Luther" and "Johnston's Early" side by side; same number of plants in each row on same soil; same treatment. The Michel's was in bloom first by two or three days, but the August Luther berries were fully ripe two days before the Michel's and four days before the Johnston's Early. From this I judge that it takes the August

Luther several days less time to mature and ripen its fruit from the blossom time than it does the Michel's Early. That I believe is a distinct advantage, for, being in bloom two days behind the Michel's Early it may miss some of the late spring frosts that sometimes do so much harm to the Michel's Early, and then ripen its fruit much earlier than the Michel's under these conditions; but it appears to be two days earlier even when no late frosts come.

The August Luther has a perfect flower, is healthy, as vigorous a flower as the Michel's. The plant in my soil is more productive than Michel's. The berry is good size and conical in shape, somewhat like the Michel's, but larger, has a slight neck; ripens all over at once. I believe there is a future before it as an extra early market berry.

Another very promising variety that comes very soon after the August Luther as to time of ripening is the "Senator Dunlap." This is also a perfect flowering kind. The first ripe berries were picked only five days later than August Luther and three days after the Michel. It grows very much like the old Crescent Seedling; resembles it in many points; is a free grower, making many plants. If let grow would make a very wide matted row. I am convinced even after one year's fruiting and from reports received of it from other sections, that it is the coming market berry. It resembles in shape and color the old "Wilson's Albany" berry; is solid, very firm; fine, dark color, and very large for so early a berry. I think it will be a good shipper. I believe market growers will report after a time that the Senator Dunlap is a great acquisition.

Not to take up too much of your time, I would like to mention one more promising new strawberry, viz., the "Miller." This also has a perfect flower. The plant is very large—as large as any I know of—and very productive. The berry is very large, and the first ripe were picked June 21st, or six days after the Senator Dunlap, growing side by side with it. The berry is bright red and borne on very strong fruit stems. It somewhat resembles the "Glen Mary." It is medium in firmness. It was ripe one day before the "Williams," is much larger, and is a variety well worth a trial by all market growers. For reasons that we do not fully understand a variety that does extremely well in one place will perhaps not do nearly as well in another place; and in a third locality will be of little or no value at all.

Q. Is the Clyde a good market berry?

A. Yes, for near market; perhaps the best. It is being very largely planted.

Among the new kinds, "August Luther," "Senator Dunlap," "Miller," "New York," "Gibson," "Sampson," "Uncle Jim," "Monitor," "11.59 P.M.," "Bennett," "Kansas," "Robbie," "Nettie," "Joe," "Carmi Beauty," "Hero," "Porto Rico," "Marie," "Honest Charlie," "Clyde No. 800," we believe will be found several that will stand well to the front, and from the market growers' standpoint will prove profitable.

A Delegate: Have you found the ground too rich for the average strawberry?

Rev. E. B. Stevenson: No; I do not think you can make it too rich.

THE AMERICANA AND NIGRA PLUMS.

By W. T. Macoun, Horticulturist, Central Experimental Farm, Ottawa, Ont.

I have prepared a paper on the Native Plum. This fruit is a very important one in the northern parts of Ontario, and also in the Province of Quebec. You will be surprised to learn that we can put the native Canadian fruits on the market from the 1st of August to the 1st of October. Where people are willing to eat these plums—and some of them are very good indeed, and worthy the name of plums—they can be sold at a time when your plums from Western Ontario cannot be had.

The European and Japanese varieties of plums are so uncertain in climates as severe as that at Ottawa that they should not be planted for commercial purposes un-

less the orchard has good protection, and even in that case there are but few, if any, that would give satisfaction.

There is no doubt that in the Ottawa district, and where the climate is similar, the main dependence must be on the Americana and Nigra plums. These varieties, though not equalling the European plums in richness and tenderness of skin, afford good substitutes where better kinds cannot be grown successfully. The Nigra, or native plum, is thinner in the skin than the Americana, but not as rich. The fruit is also usually badly affected by blight (Cladosporium carpophilum, V. Thumen), and unless thoroughly sprayed does not mature, the blight affecting it when it is nearly full grown, causing it to wither and fall to the ground before maturing. The Nigra plum a'so more affected by curculio than the Americana, which lessens the crop very much.

Although there are several species of plums that are natives of America, these two furnish most of the varieties that are profitable to grow in Ontario and Quebec.

The species found in Eastern Canada is Prunus nigra, Ait, the tree of which is distinguished easily at a glance from P. americana, Marsh, in being darker in the bark, and with a much stiffer and more upright habit than the latter. The fruit of P. nigra ripens, as a rule, earlier than that of P. americana, and is usually more evenly covered with red. Some varieties are good in quality, but, as a rule, are not as high flavored as those of Americana. The species, however, varies considerably, and some times is is difficult to decide whether a variety is P. nigra or P. americana. The trees bear heavily and regularly. The species called P. Americana is not known to occur in Canada, although the form of wild plum growing in Manitoba is much like it, but is intermediate in some characteristics between the two. Its range is from New Jersey to Montana. The named varieties which have sprung from this species comprise most of the best kinds now offered for sale. This tree grows from 10 to 20 feet in height, is of spreading habit, and is usually quite hardy where the native species grow. It bears heavily and regularly, as a rule, and the fruit of the best varieties is of good size and attractive appearance, and, although not equal in quality to the best European plums, is juicy, sweet, often high flavored. and at all times refreshing. The skin is sometimes more or less acrid, but this is not apparent when eating some of the best varieties, although when canned or preserved, it sometimes develops, though often it does not. P. americana does not suffer from blight to any extent, and this is an important reason why varieties of it should be planted instead of P. nigra, unless the trees of the latter are properly sprayed.

The following technical descriptions of the two species, made by Waugh, give their distinguishing characteristics in greater detail and accuracy:—

"P. americana, Marsh.—Common Wild Plum. The type distinguished by entire calyx lobes, which are pubescent on the inner surface ; stone turgid : leaves oval or slightly obovate; petioles mostly without glands. Tree spreading, ragged, thorny, 8 to 20 feet high; flowers large, white, on slender pedicels; leaves very coarsely veined, never glossy or shining; fruit more or less flattened upon the sides, firm and meaty, the skin tough and glaucous and never glossy, ripening through yellow to red. Occurs wild from New Jersey and New York to Montana and Colorado. It varies southward, in Texas and New Mexico represented mostly by the variety mollis.

"Var. nigra. Canada Plum, Red Plum (P. nigra, Ait., P. americana T. & G. and 6th ed. Gray's Manual. In its extreme forms easily distinguished by the glandular-serrate calyx lobes, glabrous on the inner surface; compressed stone; broadly oblong-ovate to obovate leaves with petioles bearing two glands. Flowers, large, white, with short thick peduncles conspicuously marked by the scars left by the falling of the bud scales; pedicels dark red, slender, glabrous; calyx tube broadly obconic, dark red on the outer and bright red on the inner surface; fruit oblong-oval, orange-red; stone nearly oval, compressed. Occurs wild from Newfoundland west to Rainy and Assiniboine rivers in Canada, and commonly in the New England States, where it is found along roadsides and in waste places."

The plum has been well studied by Prof. F. A. Waugh, of Burlington, Vt., and through his work the fact has been established that practically all varieties of American plums are self-sterile. In other words, there would be no fruit in an orchard

containing a number of trees of one variety only, unless the wind or insects carried pollen of other varieties to fertilize the flowers. This knowledge is of great importance to the fruit-grower. It is another indication that "nature abhors perpetual self-fertilization." While a variety is self-sterile in itself, if it is fertilized by another self-sterile variety, fruit will be formed, and vice versa. It is necessary, then, if good crops are to be obtained, to have more than one variety growing in the orchard, to have the varieties bloom at the same time, and to have them of the same species, if possible; and, failing that, to have the species as closely related as possible.

At the Central Experimental Farm there are now 76 varieties of American plums, a large proportion of which have fruited, and following are descriptions of the best of them, with names of the varieties which may be used as pollenizers to fertilize them:—

Aitkin, nigra.—Ripe August 22, 1899, and August 24, 1900. Fruit large, oval, suture merely an obscure line; color uniformly deep red all over; flesh deep yellow, juicy, sweet, but not rich nor high flavored; stone large, flat, semi-cling; skin rather thin, tough and astringent. Quality above medium. Tree a vigorous upright grower and a medium bearer. As grown here, the only good points in this plum are its earliness and attractive appearance; but earliness is a very desirable characteristic, and it is worth planting on this account. Cheney, however, which follows it in ten or eleven days, is so much better in every way, and for home use, especially, that it is much to be preferred.

Cheney, nigra.—Ripe September 2, 1899, September 4, 1900. Fruit large, oblong to roundish; suture distinct; color uniformly purplish-red all over; flesh deep yellow, juicy, sweet, rich; stone of medium size, flat, cling; skin moderately thick, tough, without stringency. Quality good. Tree upright, vigorous, and a good bearer. This and Bixby are the two best early plums which have fruited here, and they should both be planted.

Bixby, americana.—Ripe August 31, 1899, September 6, 1900. Fruit large, round; color yellow, more or less covered with red; bloom rather heavy; flesh deep yellow juicy, sweet, rich; stone of medium size, almost free; skin thick but tender and without astringency. Quality very good. Tree spreading, vigorous, and a heavy bearer. This is the earliest good plum of the americana group which has fruited here. It is well worth growing on account of its earliness, productiveness and quality. It does not ripen its fruit as early as some, nor is it very firm, but on the whole it is a good plum.

Gaylord, americana.—Ripe September 6, 1899, September 13, 1900. Fruit almost large, roundish, somewhat heart-shaped, suture distinct; colour yellow, almost covered with deep red, with a bloom; flesh deep yellow, juicy, sweet, rich; stone of medium size, free; skin moderately thick and fairly tender; slightly astringent. Quality good. Tree spreading, vigorous, and a good bearer. A fine plum.

New Ulm, americana.—Ripe September 11, 1899, September 18, 1900. Fruit large, nearly round, somewhat heart-shaped; suture distinct; color yellow, more or less covered with pink or purplish-red, sometimes the surface has a mottled appearance when the yellow shows through the red; bloom moderately heavy; flesh deep yellow, juicy, sweet; stone of medium size, cling. Skin thick and tough, but not astringent. Quality good. Tree vigorous, of a low, spreading habit, and a good bearer. This is a firm plum, and should prove a very useful sort for shipping.

Wolf, americana.—Ripe September 14, 1899, September 18, 1900. Fruit large, roundish to oval; suture fairly distinct; color uniformly dull deep-red all over; bloom moderately heavy; flesh deep yellow, juicy, sweet, rich; stone large, cling; skin thick and tough, and but slightly astringent. Quality good. Tree somewhat spreading, vigorous, productive. The Wolf, as grown at the Experimental Farm, is different from that described by most writers; one great difference being that the one grown here has a cling stone. There is no other plum in our collection, however, which resembles it, hence the name will not be changed for the present. It is one of the very best of the American plums. The Wolf described by others is also said to be one of the best. When it fruits here the two will be compared.

City, americana.—Ripe September 14, 1899, September 18, 1900. Fruit large, round ; suture distinct ; color yellow, almost covered with red, but not of a very attractive shade, bloom moderately heavy; flesh yellow, juicy, sweet; stone of medium size, free; skin thick, moderately tender, slightly astringent. Quality good. Tree low growing, spreading, vigorous and productive. The fruit of this variety is firm, and should ship well. It is spoken highly of elsewhere also.

Silas Wilson, americana.—Ripe September 18, 1900. Fruit very large, roundish; suture distinct; color yellow, more or less mottled with purplish-red; bloom moderately heavy; flesh yellow, juicy, sweet, rich; stone above medium size, semi-cling; skin moderately thick, fairly tender, not astringent; quality very good. Tree spreading, vigorous. This is the first year that this variety has fruited here, but if it is productive it should prove one of the most valuable. It is the largest and best in quality of all the American plums which have yet fruited here.

Stoddard, americana.—Ripe September 19, 1899, September 18, 1900. Fruit very large, almost round ; suture distinct ; color yellow, almost covered with purplish or coppery red; bloom moderately heavy; flesh yellow, juicy, sweet, rich; stone large, cling; skin thick, but moderately tender, not astringent. Quality very good. Tree vigorous, spreading and moderately productive. On account of its size, appearance and quality, this is one of the best of this class of plums. Next to Silas Wilson, it is the best in quality of those which have fruited here.

Hawkeye, americana.—Ripe September 22, 1900. Fruit large, roundish; suture distinct; color deep purplish-red; bloom heavy; flesh deep yellow, juicy, moderately rich; stone large, flat. cling; skin thick and tough, but not astringent. Quality good. Tree vigorous, spreading, productive. This variety resembles Stoddard very much, but is not as good in quality. It is, however, a very valuable sort.

Wyant, americana —Ripe September 19, 1899, September 22, 1900. Fruit very large, irregular, roundish, somewhat flattened; suture distinct; color yellow, but well washed and mottled with dull deep red; bloom moderately heavy; flesh yellow, fairly juicy, sweet; stone large, free; skin moderately thick and tough, astringent; quality medium. Tree vigorous, spreading. Has not proved productive here, but has elsewhere.

American Eagle, americana.—Ripe September 22, 1900. Fruit large, roundish, somewhat oval; suture distinct; color deep purplish-red; bloom moderately heavy ; flesh yellow, juicy, sweet; stone of medium size, cling; skin thick and tough, not astringent. Quality good. Tree vigorous. This is the first year that this variety has fruited here, but it promises to be a very useful sort. It is spoken of highly by others.

Hammer, hortulana.—Ripe September 25, 1899, September 27, 1900. Fruit large, roundish; suture distinct; color dark, dull red; bloom heavy. The bloom brightens up this variety and gives it a very attractive appearance. Flesh deep yellow, juicy, sweet, with the peculiar flavour of the Miner plum; stone medium in size, semi-cling; skin thick and tough. Quality good. Tree vigorous, spreading, productive. This variety extends the season of the American plums very considerably. It has one drawback in the fact that it cracks easily. It is a hybrid between Prunus americana and P. hortulana, and on this account is hardier than if it were pure hortulana. Where a late plum is desired, this is a good variety to plant.

There are some other varieties which have been highly spoken of, and which, although being tested here, have not yet fruited. Among these may be mentioned Odegard (recommended for its extreme earliness), Legal Tender, Oren, Brittlewood, Terry, Smith and Kieth. The Surprise plum, which is said to be one of the best, if not the best, in quality, may not be hardy enough for the coldest parts of this country as it is of the hortulana group, but it is said to be one of the hardiest of that group.

Varieties of Plums and their Pollinators.

Cheney, Gaylord, New Ulm, Silas Wilson, City, will pollinate one another.

Bixby, Wolf, Stoddard, Hawkeye, Wyant, American Eagle, Hammer, will pollinate one another.

Aitkin has no good pollinator among the other varieties recommended, as it is a very early bloomer. Cheney, which comes nearest being one, is not in full bloom until six days later.

This year, when there was an abundance of European plums on the market, the Americana plums grown at the Experimental Farm sold readily at 50 cents per 12-lb. basket. A tree of Bixby plums planted in 1893 gave a yield of 11½ gallons, which, at 50c. for 10-lb. basket, was $2.87 worth of fruit from that tree, and in a good season the yield would be much more. The following quotation from a recent letter received from Mr. Alex. Stewart, Hull, Que., a prominent fruit grower in this vicinity, is evidence as to the esteem with which these plums are held by other growers. He writes: "I have not fruited a very great number of Americana plums as yet, as my orchard is young, but I am very proud of some of those that I have fruited. Their hardiness, fine appearance, and good quality make them of great value to the fruit grower of Eastern Ontario, and the Ottawa Valley in particular. The best five I have fruited so far are as follows:—Hawkeye, Stoddard, Wolf, De Soto, Wyant.

"I sold my plums in 10-lb. grape baskets at 40c. per basket; 20-lb. baskets of Western plums sold for 65c. per basket at the same time. People will pay a third more for the local fruit. I took eleven 10-lb. baskets of Hawkeye off one tree five years planted. That will pay well. There will be quite a few plums planted about Ottawa next spring. I have given lists of the best varieties to a number of people. In five years from now we will see some good plums about Ottawa, and we may thank the Experimental Farm for their introduction."

Mr. H. C. Carstesen, Billings Bridge, Ont., who makes a specialty of the native plum, Prunus nigra, has also kindly furnished me with some information regarding his success with them. Mr. Carstesen's trees are practically all seedlings of his own raising, some being much better than others. The soil in which they were grown is a heavy clay loam. The trees are kept thoroughly sprayed with Bordeaux mixture to prevent blight. Mr. Carstesen now has between 300 and 400 trees in his orchard, but many of these are young. Some of his trees have yielded from four to five pails each. The following are some figures furnished by Mr. Carstesen of some of his sales:—

1899,	79 pails,	averaging	80c. per pail.
1899,	71 "	"	93c. per pail.
1900,	177 "	"	87c. per pail.
1901,	149 "	"	82c. per pail.

Some of the best of the plums sold as high as $1.00 per pail. Mr. Carstesen could not obtain these prices if it were not that his plums are very early, as they begin to ripen the first week of August, and come on the market when there is little competition with other plums. He says that he cannot supply the demand for them.

The following extracts from a letter received from Mr. C. H. Snow, Cumming's Bridge, Ont., show that all growers are not favourably impressed with these plums:—

"I cannot give you any encouragement so far as these American plums are concerned. The older the trees grow, the more rotten and miserable they look, and it would take a man doing nothing else but bolting and propping them up. Wherever there is a crotch limb, down it comes by its own weight only. The recent sleet and rain that formed on the trees about 10 days ago pretty nearly finished the best of mine; in fact, some of the trees of De Soto will break off at the stump like a clay pipe.

"Now for the fruit: The astringency in the skin shows up remarkably well when preserved. You should be at the table sometimes and hear the remarks of my children when my wife brings out some Hawkeye plum preserves. There are plenty of our old Canadian plums better for preserve, and if the people would only spray them they would be all right, and so far as selling, they bring a better price per pail, coming in, as they do, the first week in August, before the Prunus domestica class are shipped in here. This lateness in ripening is a great drawback. It brings them in straight competition with Lombard, Damsons, Yellow Eggs, and Gages. Bate & Co. sold mine this year, and the complaint was that the women folks found the skin too thick. The price paid me for a two-gallon basket was 35c., nearly a pail. Some of my neighbours got 75c. and $1.00 for common wild plums. Still, the price is all right, and would pay at this

figure if one could sell a large quantity, but the competition is too keen from a much better source, viz., the European varieties. The varieties so far fruited with me are: Stoddard, Rockford, De Soto, Hawkeye, Wolf, Weaver (2 kinds), Black Hawk; the best of these are Stoddard, Hawkeye, and Wolf."

It is very true, as Mr. Snow writes, that the tree splits easily, and this is a drawback to the Americana varieties which the Nigras do not suffer from, but if the present market for these plums continues, paying crops will be obtained before the trees are too badly split to produce fruit, and as the trees begin to bear when young they may be replaced. The skin of the Nigra, or Canadian wild plum, breaks up easier in canning and preserving than the Americana. but they are not as rich. The Cheney is one of the best of these. Many of the Americana plums are but slightly astringent when preserved. Hawkeye is one of the poorest for this purpose.

The following recipes for canning and preserving Americana plums, published by Prof. E. S. Goff in Bulletin No. 87 of the Wisconsin Agricultural Experiment Station, Madison, Wis., will prove helpful to those who have not found the plums preserve well:—

The native plums, especially those with firm pulp, after being treated by any of the methods mentioned below, are well adapted to all purposes for which the foreign plums are used. As a rule, more sugar is required for the native plums, but the preparations are rich in proportion. The harshness in the skin and stone of some native plums is readily removed by steaming them in an ordinary cooking steamer until the skin cracks; or pour over them boiling water to which has been added common baking soda in the proportion of half a teaspoonful to a quart. The thicker-skinned varieties may be readily peeled by placing them in boiling water two or three minutes. The recipes follow:—

Canning. Pick the fruit when well colored but a little hard, steam or cook in a porcelain-lined kettle until tender, put in cans that have first been treated to boiling water and cover with boiling syrup made of equal parts of granulated sugar and water, filling the can to the top; then run a silver knife around the can inside and let out the air, and seal at once. Plums cooked in the syrup are likely to be tough. Canned plums may be used for pies and for mixing with or flavouring other fruits. Plums are often canned without sugar to be used in winter for making fresh plum butter. The juice of canned plums makes excellent jelly. One lady recommends splitting native plums to the stone on one side before cooking, to avoid crumbling.

Drying. De Soto, Wyant, and doubtless other varieties may be pared, pitted, and spread on plates, lightly sprinkled with sugar and dried, first in the oven and later in the sun. Cook like dried peaches.

Plum Jelly. The fruit should be gathered when only part ripe, about half colored. This point is very essential. Put plums in a large granite or porcelain kettle—the latter is best—with barely enough water to cover them. Cook until tender, but not until they are in a pulpy mass. Having previously covered a large jar with a cloth, strain the fruit in and let the juice drop through, but do not squeeze. When all has drained through, strain once or twice more through another cloth, until the juice is perfectly clear. To one measure of juice provide one measure of granulated sugar, but do not put together at once. A very important point in the making of all jelly is that only a small quantity should be cooked at one time. Into a medium-sized kettle put, say four tumblers of juice; let it boil briskly 15 or 20 minutes, then add the four tumblers of sugar, and in a very short time—usually from 3 to 10 minutes—the jelly will be finished, light, clear and delicious. To test the jelly, dip a spoon into the boiling juice and sugar and hold it up; when the jelly clings to the spoon in thick drops, take it off quickly and put into jelly glasses. The plum pulp which is left can be put through a collander and used for plum butter."

The following is regarded as important by one contributor: The earlier in the morning and the clearer the day the better will be your jelly. A cloudy day makes dark jelly, and if not made early in the day the juice requires boiling so much longer that the jelly is dark, and sometimes it is almost impossible to get it to jelly.

Another correspondent writes: "It is well to begin to test it after boiling 15 minutes, putting a teaspoonful at a time in a saucer and setting in a cool place for a

moment; scrape it to one side with a spoon, and if it is done the surface will be partly solid; then roll the tumblers in boiling water quickly and fill them with the jelly. On the top of each, while it is still hot, drop a lump of clean paraffin, which will melt and cover the top quickly, preventing moulding. If prepared in this way it will not need to be tied with brandied paper or other special care taken."

Plum Butter, Jam, or Marmalade. Boil the fruit in clear water until nearly done. Remove from the stove and put through a colander to remove the pits. Then rub through a sieve to make the pulp fine. Place pulp in a kettle with about half as much sugar as pulp, or, if you wish to have it very rich, nearly as much sugar as pulp, and boil down to the desired thickness. Stir almost constantly to prevent sticking to the kettle.

Plum Preserves. Take equal weights of fruit and sugar; place in stone jar a layer of fruit, then a layer of sugar—alternating thus until quantity desired is reached. Let stand over night; in the morning drain off the syrup that will have formed into a porcelain-lined kettle, place same over the fire and let syrup come to a boil; then pour it over fruit in jar again; repeat this every day until the fourth heating, when fruit and syrup are both put in kettle and boiled for a few minutes. Place same in glass jars while hot, seal and put away in some cool and preferably dark place.

Still another recipe. To each pound of plums add a pound of sugar; put the fruit into boiling water until the skins will slip; peel and sprinkle sugar upon each layer of fruit in a bowl, allowing them to stand over night; then pour off the juice, bring quickly to a boil, skim and add the plums; cook very slowly till tender and clear, which will take about one-half hour; take them out carefully and put into a pan; boil the syrup a few minutes longer until it thickens; pour it over the fruit; seal or tie them up.

A better plum for this part of Canada will probably be obtained by crossing the Nigra with Americana, as it is possible that a variety may be originated which will have the tough tree of the Nigra and the thinner skinned fruit of that species with the productiveness and freedom from disease of the Americana and the quality of that species.

The trees at the Experimental Farm are 10 feet apart in the rows, the rows being 20 feet apart; this greater distance being required in order that the trees may be thoroughly sprayed. Ten feet is a little too close in the rows, as the trees are already interlacing, but this could not very well be avoided, as the original trees were planted 20 by 20 feet apart, and the additional trees set half way between. A satisfactory distance would be about 15 feet apart each way, which would permit of thorough spraying for a long time. The trees, which are rather easily broken and split on account of the heavy crop they bear and the great growth they make when young, are better protected than if they were planted further apart.

Many seedling plums are being grown at the Experimental Farm, and a number of the Americana seedlings have borne already. Of these there were only three which were considered equal or superior to best named varieties under test.

Before sitting down I would call your attention to a bulletin on Apple Culture published this year. I have long felt the necessity of a bulletin on this subject, and after gathering as much information as possible from the best apple growers of the country I prepared this bulletin, which may be had free for the asking. I think it covers the apple culture pretty well. In it are lists of the different varieties which I have recommended for the different sections of the Provinces of Ontario and Quebec. We divided them into thirteen districts, which are marked off with heavy lines. Then I have given a list of apples which I considered most suitable to grow in those districts, with the description of them.

PROFITABLE GRAPES.

By M. Pettit, Winona.

I did not suppose we would reach this subject on the programme, as it was so full, and I told the President that I would give way for Prof. Hutt's subject, it was of so much greater interest to the country at large, as grape-growing is confined only

to some localities. If I give you a list of varieties that are profitable with me they possibly might not be profitable in other localities. I think there is no fruit that varies so much with the soil and the locality as the grape. I have given a fairly good test to over 140 varieties, and I will mention some that have been most profitable with me. In white grapes the Niagara is one of the most profitable, largely on account of its producing such enormous crops. The next white grape in profit to that is Moore's Diamond. It is not so prolific, but being earlier and of good quality commands the highest prices, and that makes it rank about next to the Niagara in profit. In red grapes I would mention the Lindley, Roger No. 9, Agawam, Roger No. 15, and the Catawba—although in many parts of the Province the last named would perhaps not ripen. In black grapes the Worden and Concord and Roger No. 4, Wilder and Barry No. 44.

Mr. W. A. Whitney : Would you mention the Brighton ?

Mr. M. Pettit : No, sir, not for profit. It is inclined to mildew, and it is not a very regular bearer.

SAN JOSE SCALE.

Mr. M. Pettit : In moving the resolution at the meeting on Thursday I should have asked that the old committee be reappointed, or a new committee should be struck ; consequently it is moved by myself and seconded by Mr. Beall that the San Jose Scale Committee of last year be reappointed. (Carried.) The following are the names of that Committee :—M. Pettit, G. E. Fisher, E. Morris, W. M. Orr, Robt. Thompson, W. H. Bunting, J. D. Wigle and Major Hiscott.

REPORT OF THE TRANSPORTATION COMMITTEE.

Your Committee beg leave to report as follows :

That while the concessions previously secured by your Committee have been continued and maintained, they regret to state that they have not been able to bring sufficient pressure to bear upon the Canadian Joint Freight Association to secure the adoption of several of the remaining clauses of the schedule as submitted to them on behalf of your Association. These clauses, although considered by your committee to be just and reasonable, have been declined by the R. R. authorities each time they have been presented.

Your Committee recommend for your consideration the following suggestions :

1. That a revised schedule of reductions in rates and improvements in service be laid before the R. R. officials for their consideration, with a strong request for their acceptance, in order that at least to some extent justice may be done to the fruit industry.

2. That, inasmuch as improved systems of refrigeration and ventilation, in connection with the carriage of fruits, have been favourably reported on from the tests already made, and since the car service in this respect has not been satisfactory in the past, the railroads be requested to arrange for a more extensive equipment in this respect, on some plan that may show reasonable prospect of success.

3. That matters of local grievance or hardship in connection with the transportation of fruits be promptly reported to the Secretary of this Association, with full details, in order that complete information on this point may be obtained, and efforts put forth to relieve the same if possible.

4. That some comprehensive plan be adopted whereby the local conditions of oversupply or scarcity of fruit in any particular district may be promptly made known, so that a more even and satisfactory distribution of our more perishable fruits may obtain.

5. Your Committee note with satisfaction that improvements in the service are being made by the Steamship Companies, and while they regret to learn that the financial results from export shipments have not yet been of such a nature as to inspire confidence in the shipper, they trust that the time may not be very far distant when it will be possible to land our apples and pears in the English market in uniformly good order, and with a reasonable assurance of a safe and careful handling throughout the entire journey. To this end it is hoped that the Dominion and Provincial Governments will continue to supplement the valuable assistance already rendered in this respect, which has been productive of good results.

All of which is respectfully submitted.

(Signed) Wm. H. Bunting.
T. H. P. Carpenter.
E. D. Smith.
A. H. Pettit.

Mr. W. H. Bunting : The report as presented to you is the crystallization of the efforts of the committee in two protracted sessions, and the result of some considerable correspondence, and after hearing yesterday the addresses of Mr. Dawson and Prof. Robertson, if time would permit this subject might be enlarged upon, but as the matter was taken up yesterday to some degree, and as your programme is more than full, I think it would not be wise to say anything more in reference to this matter, except that it is the mature judgment of the committee after full consideration. I would move that the report be received and adopted.

The motion was declared carried.

Mr. A. McNeill (Walkerville) : It does occur to me that this subject should be discussed in a meeting of this sort. It is perhaps more important than any other subject that has been taken up here to-day, and I for my part, though a member of the committee, can say that I am not at all satisfied with the work of the committee. I say most emphatically that the most important committee that this convention has appointed has not done its whole duty. The reason is perhaps that the Chairman has had more than he could do, and do it well, and the other members were not able to cope with the problem that was before them; and I want to say just this much, that I do not think it would give a proper expression to the opinions of this Fruit Growers' Association if it should go out that we simply received this report—this rather milk and water report—for I helped to make it myself and know what it is. It should not go out to the public that we are satisfied or very nearly satisfied, and in only a weak sort of way would object to what we are suffering from the Transportation Companies. This is a subject that is right at the basis of our business You can plant all the orchards and vineyards and plantations that you please, and you can take care of them as well as you may, but it is the Railway Companies that are going to get the profits. I hope this subject may be discussed at some stage so as not to give the impression that we are satisfied or anything like satisfied with the treatment we are getting at the hands of the railways.

Mr. E. D. Smith: We have accomplished something—as much as I ever expected we would accomplish; we got grapes placed into a lower classification, and got the concession that grapes and other fruits in mixed carloads should each carry their own rate, which was something. It was a sop thrown at us, but it is utterly useless for us to go before them unless we are able to say that there is some great injustice done. Until we are prepared to do that we are only wasting time, and since we have been before them twice I think it would be well to have a new band of men.

Mr. G. C. Caston: I think we should move in favor of a Railway Commission, and I would move an amendment that in the opinion of this Association the time has now arrived when a Railway Commission should be appointed with power to regulate the grievances with respect to freights in Canada.

Mr. D. J. McKinnon: I have a resolution exactly on these lines, seconded by Mr. Race of Mitchell.

"That various committees and deputations, from this Association and from other bodies of fruit growers have from time to time laid before the railway authorities the injustice of the freight rates and regulations affecting the transportation of fruit; that the railway authorities have invariably refused to grant any but the most meagre concessions; that your committee see no reason to hope that any rate less than "what the traffic company can bear' will be voluntarily conceded by the railways; that the Dominion Parliament is the only authority in the country with the power necessary to compel transportation companies to do justice to the public; that your committee therefore recommend that the Government of Canada be memorialized to appoint a Railway Commission without delay to fix reasonable rates for the carriage of goods by freight and express, and to provide for the enforcement of all rates fixed and regulations made by such commission by the most summary and simple process possible, with heavy penalties for all infringements of such rates and regulatons."

Mr. McKinnon's resolution was put and carried.

Mr. Bunting moved, seconded by Mr. McNeill, that the transportation committee be as follows: H. D. Dawson, Toronto; J. G. Graham, Belleville; E. D. Smith, Winona.

OUR BEST COMMERCIAL APPLES.

By Walter Dempsey, Trenton.

When I came here I had quite a few thoughts about what I should say, but listening to these men that have gone before me I find that they have tripped me up in many lines, and they have taken away what I had thought out. Mr. Caston told you that the northern district was the best in the Dominion for apples. Others claimed other sections as the best. We in the Bay of Quinte District claim it as one of the best apple sections of the Dominion. (Applause.) I believe there is proof for it in the gold and other medals that you see going to that district from the Pan-American this year. There have been a great many apple trees set in the last few years in our section. The varieties that have been most largely set are the Ontario, the Spy, Hubbardston's Nonsuch, Strawberry Pippin, Gano, Stark, Ben Davis. and in Prince Edward County the Arctic has been largely set. As to the apples that I have found in my own ground that have been paying for years right along—I begin to ship apples the last week in July and continue that season till along in April—I have found to suit me best the Duchess, commencing the last week in July, and then following on in rotation Trenton, Wealthy, Fameuse, Hubbardston's Nonsuch, Westfield. Seek-no-further, Ontario, Spy, Stark, Ben Davis. I have found these varieties very profitable in my own orchard. Then as to the varieties that have been under test, two which are looking most promising just at present in my idea, for shipping, in winter especially, are Aiken's Red, a medium-sized red apple, and York Imperial, which is a very bright, beautiful apple, a little different in shape from the one that we had upstairs.

Mr. J. Tweddle: Does it mature in color and perfect in every way.

Mr. W. H. Dempsey: It did with me. I was well satisfied with it. Then comes Sutton's Beauty, Missouri Pippin, Rome Beauty, Mammoth Black-Twig. I think that these may possibly yet come to the front as commercial apples. In looking around through our towns and villages I find a number of amateurs who are endeavoring to grow apples in a small yard. I do not think we need stand by and let them run away with the idea that they should plant just Ben Davis and Gano and some of those varieties. I would recommend for their benefit the Primate. It is quite an old apple, begins to ripen with me in July, and continues on through September ripening slowly along, and the fruit is very delicious in flavor. It carries its rich flavor into sauce and into pies. It very much resembles the Boiken. The Star comes into season about the same time as the Primate, is very

near the same in flavor, but it does not last as long. Then McLean Garden Gem; then the Winter Banana and Boiken, which resemble each other very closely, but as a rule in the Bay of Quinte we do not get quite as much color as Mr. Caston does on those varieties.

Mr. Caston: In that list for amateurs with small gardens they are principally all dessert apples of high quality.

Mr. Dempsey. They are high quality for the amateur garden. The last two may come into commerce, but the others are too tender for shipping I would think.

A Delegate: What about Yellow Transparent?

Mr. Dempsey: I would take the Primate for my own use before the Yellow Transparent. They are about of the same season.

Mr Caston: It is good for about three or four days.

Mr. Elmer Lick: Is the Primate tree hardy with you?

Mr. Dempsey: Yes, it has proved perfectly hardy with me, and a heavy cropper.

Mr. Caston: It is only about half hardy with us.

HOW TO PRODUCE FINE APPLES.

By Harold Jones, Maitland.

Most of the audience here seem particularly anxious to grow fine apples. I think it is hardly fair to throw such a responsibility on me, who has had so little experience in that matter. And then when I think over all that has been discussed here—the questions of pruning and spraying and the selection of varieties and cultivation—and all those things that have been taken up so ably by our men, what is there left for me to talk about? I think the keynote to the whole question is one that is little thought about by a great many growers, and that has had very little consideration, and that is the adaptability of the varieties to the different sections of our country. Among us to-day there is a general lack of knowledge as to the capabilities and resources of the localities of our Province alone, not to speak of the whole Dominion. In the past there was a very sad lack of knowledge of the resources of our country, as shown when Judge Ford of Ogdensburg a few years ago, in sentencing a person, banished him "from off the face of God's earth into Canada." At that time we had not such men as Prof. Van Deman and Prof. Waugh paying us friendly visits from time to time. I am afraid they had rather a vague idea of where Canada even was. Coming down to more recent date, what do we find among ourselves? Six or seven years ago at the annual meeting of this Association at Woodstock a man asked me if we could grow anything away down east on the St. Lawrence except Crab apples? He little knew that away down there is where we grew the finest Fameuse apples in the country if not in the whole world. (Hear, hear.) Where else in the world has any apple received such attention or received such a name as the Gravenstein of Nova Scotia in the Annapolis Valley? Then again when you come to other points in the world other apples are grown to special excellence—down in the Hudson Valley the Green Pippin, in Virginia the Albemarle Pippin, in southern Illinois and Missouri those tremendously large bright Ben Davis, such as surprised us at the Pan-American Exposition. Coming nearer home, where do the buyers of the world come to look for their Spys and Baldwins if not to the northwest portion of the State of New York and to central and western Ontario? Then, when you want to get those large, beautiful, high-colored, fine-textured Snow Apples or Fameuse, or apples of that group, you have to go down the Valley of the St. Lawrence and possibly on the Islands of Lake Champlain, and that is where these apples grow to perfection. I am using those varieties only as an illustration. Of course in many sections there are special varieties which grow to special excellence, and we need a more general knowledge as to how far and to how large an extent these apples will succeed. They are particularly valuable to local sections, and in the future we may find them equally valuable for large

sections, but that remains to a large extent for our experimental stations in the Province, and stations and fruit gardens carried on under similar control in all other countries to decide upon those questions. In the meantime it is decidedly to our advantage to grow the apples that we know succeed in our section; grow the apples that we know that the buyers want; grow them in large quantities in one section, so that it will attract the buyers from all over the world. so that they will come to us from the old country, from those countries in Europe where there are so many apples wanted, so that they will come to us up the St. Lawrence and say, "Here is where we get the Fameuse and the Scarlet Pippin and the McIntosh Red, and we want them from you and we will pay you good money for them if you will just grow them right and spray them right, because you have got the soil and the climate to grow them to perfection.' They are going to Vermont and to central Ontario for their Spys, and down the Hudson River for their Greenings and their Newtown Pippins, and back into Nova Scotia again for their Gravensteins, which they can get there in plenty and of uniform quality, and that is what they want. The buyers have told us time and time again, "Send us one good variety in good quantity, and then we can command the price for it." If you want to grow fine apples do not set out every variety of apple that is recommended to you by the nurseryman or his agents. The travelling agents will almost in every case try to sell to you the varieties of which the nurserymen have the largest supply, and those varieties are generally the ones that are the easiest grown in the nursery row, and that one thing often leads to the planting of varieties in sections of the country where they are not at all adapted, and they will never be able to grow apples that will receive any attention from the buyers whatever. Now to illustrate: If we down on the St. Lawrence should undertake to grow the Spy and Baldwin, and our fruit growers in the Grimsby district should undertake to grow Snow apples, and we stuck to these varieties and kept at it, in a very few years I think we would both come to the same opinion, that apple growing is a very unprofitable business, and that it was almost impossible to grow an apple anywhere in this country that was fit to eat. Now we can remedy that matter by just changing over varieties and taking our own. (Applause.)

Mr. Graham: People who have been endeavoring to ship apples have found serious difficulty with so many varieties. You can scarcely go into an orchard of any size but what you have twenty varieties. If we buy a few thousand barrels in any section of Ontario we probably have forty varieties in that district. It materially injures the commercial value of the fruit to have so many varieties. If we grow to ship to another market we can get very much better returns with two or three varieties in a car than we can with forty, even if they are all of equal merit. Rather than grow so many varieties if we would confine ourself for commercial purposes to at least ten we could grow all the apples that the foreign markets demanded and get much better results from it.

Mr. Maher: I am only a local man. As I understand, one of the objects of this convention is to overcome so many different grades and qualities of apples. We are here to get information, to know from this onward just the best kind of trees to plant. In years gone by our forefathers did not know the best kind of apple to grow, so no blame should be attached to them. Mr. Jones gave us some very valuable information. but I would like him to go a little further and tell us what soil these trees that he has spoken of do the best on. Through this locality I know the soil differs every two or three miles. In the eastern part here we have heavy clay, from here west we have very light land, so that while the climatic changes are not different the soil differs very much.

QUESTION DRAWER.

Q. "What is the cause of the failure of the apple crop this season?"

Prof. Van Deman: Well, there were various causes that led up to the failure, and in a large measure the apple crop failed because of the unfavorable climatic conditions in the springtime. That was the general cause of the apple failure of North

America this year. There are some parts of the country where this condition did not prevail, especially in Washington and Oregon, where we have had a very abundant crop, and in a few places in the lower Appalachian Range in Virginia and North Carolina, where they had a very fine crop. In Kansas and Missouri they had a pretty good start. The apple crop set out well, and then they had a very severe drouth that covered all that prairie region and nearly destroyed the apple crop, but finally the fall or late summer rains came on, and they had a fair crop.

Q. "What variety of apple has done best the past season ?"

A. Well, I do not know. I expect if I were to say it I would say Ben Davis. (Hear, hear.) Ben Davis is about the hardiest variety, all things considered, that we have, take the country all over; and I must say I am very sorry to see the Ben Davis doing so well up this way. (Laughter.) It is a good deal like what my friend Baush of Oregon says : "No matter where you find it, it always has that delightful sawdust flavor. (Laughter.) It certainly does lower the standard of the apple the world over to have this miserable Ben Davis constantly up before the people of the country to buy, and while I do not think the fruit growers at home consume very much of it, I know I never eat a Ben Davis unless I am dreadfully pushed—(laughter)—still it is the business apple of the market to-day. There is no denying that fact, and it is pushing its way in spite of all sorts of argument. It does not need any argument. It argues for itself. I have argued against it, and—I do not know why—I plant it—(laughter)—and I suppose I am inconsistent like a good many of the rest of us. We don't like it, and yet we plant it. Why do we plant it ? Because of the dollars that are in it, and that is why. That is the commercial view of the situation, and I am sorry to see it doing so well in Ontario. I solemnly protest against its planting, and yet it is here, and I do not know but it is here to stay—I am afraid it is. (Laughter.) It seems to be taking root as far north as Nova Scotia, and here is our good friend from Prince Edward Island who thinks that it is one of the luxuries up there. Oh, that makes me feel bad. (Laughter.) Now in Missouri and Kansas it is an eminent success, and the Ben Davis that grows there is quite a different apple from what grows here. It has a better quality, it has a better chance of developing, and it is handsomer in color, but here is one, for instance, that is picked very early, and a Ben Davis from Missouri that is not near up to the standard, that is more like the Ben Davis that grows here; in fact, you do a good deal better than that, and so does New York. (Yes, and hear, hear.) If I were planting here I do not think I would plant Ben Davis (Laughter.) No, I think I would plant the varieties that you have been making money of. Perhaps not a Baldwin; I think that Baldwin is not really any better than the Ben Davis, take it up one side and down the other, when it comes down to quality. I know there is a good deal more quality here in the Baldwin than in the Ben Davis, but I am talking now about the Ben Davis in the Ben Davis country, comparing it with the Baldwin in the Baldwin country. I think they are just about six and half a dozen in quality, and the Ben Davis is finer in color and appearance. Appearance is a good deal, and I should advise you to stick pretty close to the old-timers here rather than to venture far on in these new things, even Ben Davis. But let me say I would not discourage experiments. Experiments are just the things that teach us the best things to do, and I should try these varieties that are named, everyone of them, except—well, you might try that in a very small way—and that is the Mammoth Black or Arkansaw—and I should exclude the entire Wine Sap family from this part of the country at all. I do not think the Wine Sap or any of its kin belongs here whatever. York Imperial has been mentioned : I would advise you to try that. I saw it this year to my astonishment, a pretty fair looking apple in Nova Scotia, and I am quite confident that it will do well in a considerable part of New York State, especially the Hudson Valley, and in western New York and in part of Ontario.

Mr. E. Morris : It does well in the Niagara district.

Prof. Van Deman : I think that is one you can plant commercially, but I should not advise you to do more than plant it experimentally, and then you could tell what to do with it.

Mr. Caston : Where did that apple originate ?

Prof. Van Deman : In Pennsylvania. It does not matter where an apple originates; where an apple happens to start from, is of no more consequence than where a person happens to start from. It depends on the person as to what there is in the thing.

Colonel Roger : Do you know the origin of the Ben Davis ?

Prof. Van Deman : Well, that is a little bit mystified. The Ben Davis is supposed, by those who have dug the deepest into history, to have originated in Tennessee. Some think it originated in Virginia and was carried into Kentucky. It came through Kentucky into Illinois, and that region. Tennessee is likely the original home of it. Now the Rome Beauty is another one that I should advise you to try. I am very much pleased with the behavior of the Rome Beauty in this country. Of course, it is a little tender in tree, and where your winters are very severe you will not find it acceptable. In southern Ontario certainly I believe that the Rome Beauty is going to be all right. Gano has been mentioned, which is nothing but a redder Ben Davis—just a Ben Davis with more solid color and less stripes; more red is all you can say for Gano. I know the place of origin of it. It is perhaps a bud from a tree in the State of Missouri, and to all intents and purposes it is a Ben Davis, and it will do just as well as Ben Davis and no better.

Mr. Morris : What about the Sutton Beauty ?

Prof. Van Deman : Yes, the Sutton Beauty is certainly coming to the front. It is a better—that is more constant—bearer than the Baldwin, and better quality and good color and about the same in size, and I think Sutton is one of the coming apples for this part of the country. It is a red winter apple of good quality that we are after. (Hear, hear.) Now, I would like to talk Jonathan to you, but I am afraid Jonathan is a little too small. (Yes.) Of course, in the southern part of Ontario it may be all right, but it is rather small. When you come to a fancy market apple, and a first class A1 home apple, give me the Grimes. That is one of the apples that you ought to top-work, at least two or three of your trees on every one of your farms, and have something to eat at home that is good.

A Delegate : It turns brown.

Prof. Van Deman : I am talking about it every time. It will scald a little in storage, but not very seriously. Do you find it so ?

A Delegate : I am repacking this week and they are quite brown now.

Colonel Roger : You do not mean the Grimes Golden Pippin ?

Prof. Van Deman : Yes.

Colonel Roger : I would not give you ten cents for a shipload of them.

Prof. Van Deman : I am talking of fancy market.

A Delegate : I would like you to find a fancy market for mine.

Prof .Van Deman : I would certainly plant some Grimes here until I was sure they were wrong.

Mr. A. McNeill : They grow well here. The trouble is the market will not endure them in barrels.

Mr. G. C. Caston : In our section of the country they are absolutely tender.

Colonel Roger : They are of no use for this section.

Prof. Van Deman : With me it has not been any more tender than the Ben Davis.

Mr. Jack : I find it hardier than the Ben Davis in the city of Montreal.

Mr. A. E. Sherrington : With me it is perfectly hardy and an annual bearer, and for home use I do not think you can get anything better.

Prof. Van Deman : Now you see we have got a variety of conditions.

Mr. Sherrington : Can you tell me anything of an apple grown in your country called the Red Williams ? It is always quoted at the top of the market.

Prof. Van Deman : It is a very good early, not the first early, but the second early summer apple, of very good quality and beautiful appearance, fair size, one of the handsomest market apples you could find at all. I should think that ought to be well known here. It is an old variety, I guess 100 years.

A Delegate: Why do not you say Northern Spy and be done with it?

Prof. Van Deman: For a winter apple? Oh, yes; the Northern Spy is a splendid winter apple. I said a while ago I would stick to the old-timers very largely. I think I should plant Northern Spy if I were here.

Mr. McNeill: Would you if you were not to remain half a century?

Prof. Van Deman: Yes, the younger I was the more I'd plant. (Laughter.) I want to mention the Missouri Pippin. You know we are cutting off these superfluous names. A pippin doesn't mean anything at all but a seedling from the pips, and just as well drop that out; the whole "seedling" and "pearmain" and "pippin" business we are going to relegate to the back ages. That Missouri is a red winter apple of fair quality, fair size and extremely early in bearing, as much so as Yellow Transparent, and as a filler, it is in my opinion one of the coming apples for your region. It will not grow big enough, I am afraid; it will be hardy enough—it is as hardy as Ben Davis and goes right along with Ben Davis in the central States. Mr. Wellhouse, of Kansas, made more money out of the Missouri than he did out of all the other varieties up to the first fifteen years. You say, "Well, fifteen years, we have only got started then." Well, but he had his orchard paid for, and the Missouri that he had planted paid for the whole thing by the time the Ben Davis was well into business; the Missouri was practically done, but it served its time, and I should plant it instead of planting peach trees. I would never plant a peach tree in an apple orchard. (Applause.) I have tried it and have seen it tried thousands of times, and with very few exceptions I would condemn it from experience.

Mr. Boulter: Would you put plums in?

Prof. Van Deman: I would put apples in an apple orchard and peaches in a peach orchard, and plums in a plum orchard. There are several reasons for that, and one is that the treatment that an apple orchard needs is not always the treatment that a peach orchard needs, that is as far as tillage is concerned. Perhaps you want to seed down an apple orchard to clover or something of that kind. Now a peach orchard ought to be cultivated for ever and for ever as long as it stands. I would never seed a peach orchard down to anything; and then when it comes to spring, you know, the wind blows when it wants to and not when we want it to, and sometimes it blows the spray from the apple trees over on to the peach trees and injures them. The greediness of the peach tree is another very serious objection to its being planted in an apple orchard.

Mr. Demill: Would you recommend clover in an apple orchard?

Prof. Van Deman: Yes, I think that is a very good thing. I think clear tillage is the best thing all round, but occasionally I would seed it down to clover. I was going to say another thing about this matter of fillers, that if you will put your permanent apple trees forty feet apart, and then fill up with these early bearing kinds, you can put in Wealthy, Yellow Transparent or Missouri or Wagner and fill up between the rows, and then put in an extra row every fifth row. That is, every third row of fillers leave out, having two rows of fillers and then skip, but put in right through the other rows for every tree a filler, and those fillers will have paid for the orchard, so that it won't have cost you one cent an acre by the time the permanent trees need all the ground, and then you can cut them out. Any person who has not got grit enough to cut a tree out when it needs to be cut ought not to be in the business. It is ust the same as it is with a pig; when a pig gets to killing time, kill it, that is what we raise it for; and whenever the permanent trees need the room, give it to them, and that is my doctrine. Put your trees forty feet apart. If I were further west I would talk about closer distances, but here forty feet is not too far. That brings up this matter of pruning. That talk of Mr. Hutt's this morning was excellent, first class; I say "amen" to every word he said. He told you gospel truth on orchard pruning this morning, and I should give those trees abundant room. It is fruit that we are after, we are not in the forestry business, nor in the seed business. Let us grow trees for the fruit, and the better that fruit is the better prices we can get. It is fruit we want, whether we eat it or sell it, and the better it is the better for us. That brings up the subject of these old orchards you have that

have got their limbs intertwined and that are crowding each other, and there is a good deal bigger feeding going on under the ground that there is in the air. (Hear, hear.) Because those roots are longer than we think, and they are hungry for moisture and for fertility, and you have got to give the tree under ground plenty of room or else it cannot do much above ground; that is just as certain as anything can be, and if you don't feed that tree in the ground, I assure you it will not get food out of thin air. It will get the wood part out of the air and every atom of that, except what is left in the ashes after you burn it; it will get the carbon out of the air, but it will not get the fertility out of the air to make that grow; and whatever you do you have got to give that tree room. I should just take one of those old orchards, having some of those little scrubby apples on, and I would make firewood out of about three-quarters of the trees, and take care of the rest of them. I have been in a great many orchards where this very heroic treatment has been tried with eminent success. I could refer you to many apple growers in the State of New York who have had a lot of these old orchards treated in this way and they found it paid. I was at Mr. Beck's place, in Batavia, where he had old trees that would bear twenty-eight bushels to the tree, sound to the centre, as solid as any tree you ever saw, but they had been crowding their neighbors too much and he wanted to get a better grade of apples, and wanted to get the sun on all sides so that the leaves would develop. You cannot have good fruit unless you get good foliage. Good foliage is one of the cardinal principles of good orchard treatment. It is a flag that Nature hangs out as a sure indication of what that tree is doing. That good, healthy, dark apple leaf tells you that the tree is in good condition. Whenever it is weak and sickly looking you know that there is trouble on hand, and the sooner you give that leaf a chance to expand the better it will be for you, and I should not wait at all about taking the case of some of those apple orchards you have got, this very next winter. There is no use in trying to prune off the lower branches and help the tree that way. That just simply elevates the trouble, puts it up a little higher in the air.

Mr. Demill : What do you recommend as a fertilizer ?

Prof. Van Deman : That is a big subject. Now you have a fertile soil, in fact Nature has put into the soil here two elements in great abundance—phosphoric acid and potash. The nitrogen is wanting, but we have in the air above us an abundant store of nitrogen. In the air above an acre of ground we have $4,000 worth of nitrogen. The air is full of it, and if you will only set those nitrogen traps to work—beans and peas and those pod-bearing plants—they will take it out of the air, you are getting that much nitrogen out of the air and putting it into the ground. And the same is true of the Canada Pea or the Cow Pea.

Colonel Roger : What do you mean when you say $4,000 worth of nitrogen per acre ?

Prof. Van Deman : Per acre of air. Yes, four-fifths of the bulk of the air is free nitrogen.

Colonel Roger : How high did you figure ?

Prof. Van Deman : You would have to go up there and see. (Laughter.) I want to say about nitrogen, that if you manure with any kind of commercial nitrogenous manure you get nitrate of soda, that is about the best kind there is, and then mix it with something else, and put it in in the summer time, in the growing season. Nitrate of soda is about the cheapest commercial fertilizer you can buy, slaughter-house refuse, and so on. Stable manure is all right, but I am talking about good commercial manure.

A Delegate : What about ashes ?

Prof. Van Deman : Good ashes that have not been leached are first rate, excellent and in splendid form, but it is not nirogen.

A Delegate : Do you know the Black Ben Davis that is now being boomed ?

Prof. Van Deman : A Black Ben Davis is just simply Gano. At least if Black Ben Davis has a separate origin they are so near alike that they cannot be told apart in fruit or tree or foliage; they grow just alike and behave just alike.

A Delegate : What about the Stark ?

Prof. Van Deman : The Stark is too green, not high colored enough. It is a good apple otherwise.

Mr. Morris : Set us right about the Canada Red Apple.

Prof. Van Deman : Have you the Canada Red ; this (sample) is not a Canada Red at all. The Canada Red, the one that was first named Canada Red, is an apple of very high quality, delicious, tender, fleshy, and not very big. It is not a successful orchard tree.

Mr. Rickard : In regard to the Spy, do you think that could be grown clean and the spot prevented by spraying ?

Prof. Van Deman : Oh, yes. Spraying will knock out the scab even on Fameuse, but I should grow McIntosh instead of Fameuse.

The President : I want to introduce Mr. Blair, Experimentalist at the Nappan Station, Nova Scotia, who has been atteding our meeting, but whom we have not been able to hear before.

Mr. Blair : I assure you that I did not come here for the purpose of instructing you, but rather to learn that I might assist our fruit growers in the Maritime Provinces. I have not come here feeling that we were ahead of you in any respect, but rather that I could learn; and I have learned. I think that your meetings have been very instructive. We have been enabled to glean much information on various lines, and we will take that home and try to use it. We have a Fruit Growers' Association in Nova Scotia that is working along some of the lines that you are, and in our discussions we have the same subjects brought up, and they are treated in a somewhat similar way. I thank you for your kindness, and I shall go away feeling much benefited by my trip to this part of the country. (Applause.)

COLD STORAGE AT THE PAN-AMERICAN.

By Robert Thompson, St. Catharines.

We have had a good deal about cold storage and the keeping of fruits at this meeting, but we have not had half enough. I would suggest that in future the meeting be divided into two parts, for the discussion of various subjects. In the past the Association has been educative along the line of growing fruit; but the marketing or selling is half the battle. It was thought that we could not keep up the supply of fruit at the Pan-American during the early summer months until our present years' fruit came in. We were afraid it would not keep after it left the storage. To our surprise, this is not the case. We found that fruit would keep as long after coming out of storage as it would after being picked off the tree and placed on the table. (Hear, hear.) I am speaking of fairly good keeping apples ; there were some exceptions in fall varieties. It struck us forcibly there that storage is only in its infancy ; and the discussions here the last few days have borne this out. We have much to learn. Since being at Buffalo this summer I have more faith in fruit growing than I ever had before. I feel there is no danger of glutting the fruit market—that we can put it in cold storage and keep it the way it has been kept this summer, and we will have fruit the year round. At the Chicago Exposition the New York State Association expressed their surprise at apples keeping well, and attributed it to wrapping. In our case we did not wrap the apples, and we found they kept equally well ; indeed, from our experience and observation of what some States did they did not keep as well when they were wrapped as when they were not. But apples had to be taken out of storage carefully ; they could not be taken out and carried to a grocery store in a wagon, or we could not put them in baskets down at the storage and cart them up to the Exhibition grounds without suffering great deterioration. We brought them out of the storage building just as they were packed there, and allowed them to dry off before they were taken out of the cases. In one or two instances we took them out before they were dried off, but we took them out very carefully, so that they were not rubbed or chafed in

any way, and allowed to absorb that moisture, and then they would keep for weeks and months. There is an apple upstairs that was taken out of storage on the 14th May. I have at home two that I preserved as relics, and they are in pretty good shape yet. Another point is that some varieties will keep better than others. You would naturally suppose that apples like Ben Davis and Mann would keep longer than Holland Pippins, Blenheim Orange, and some of those fall varieties ; but we found during May, June and July that those fall varieties were keeping equally as well as the Mann and Ben Davis, and kept better than the Baldwin, Spy and Greening. The lesson I learned about that is this : In the fall we have an over-abundance of fall apples that are hardly saleable, and in a good many seasons our apples will be short. In future, instead of letting our fall apples go to waste, place them in cold storage, and by Christmas and afterwards you will be able to sell them for good money. As to tight and open cases, we might point to success in both cases in our experience at Buffalo. The apples were wrapped in two thicknesses of paper, one of wax paper next the apple and the other of tea paper outside. Some of those apples were almost air-tight, because the wax paper was twisted. We could not see much difference between the apples packed in that way and those that were put in fairly open cases ; but we did notice that apples that were packed in egg cases, without anything around them in the way of excelsior—just wrapped in paper —came out without any scald, notably the Greenings. We had one case left by mistake until some time in August, and the others that had been opened that were packed in cases in excelsior had been spotting very badly before that. When this case was opened, to our astonishment it was the only case that was packed in the card-board cases ; it opened 98 per cent. good. You could not ask for anything better than that ; there was not a single apple spoiled in that case. Another point that struck us was this : that we could not exercise too much care in placing our apples in storage. We did not know where these apples came from last fall, or the history of them, but we could see that in almost every instance apples that were spoiled had received injury before going into the case. This was not the packers' fault, because the apples had been shipped to them in barrels, and you could see the mark of one on the other, and in those cases the apples would not be good. In other cases they would turn out 100 per cent. good. Three cases were opened that had remained in storage the whole season. Two of Ben Davis opened up 54 apples, only 5 bad ; the other one 52 apples, 5 bad, two of these only partially decayed. The Mann apple opened up 100 per cent. good. (Applause.)

Rev. Father Burke : I have simply two or three words to say, and they are words of thanks for the kindly reception you have given me since I came here. I am sure I will take back to Prince Edward Island many lessons I have learned here. I came 1,500 miles, but I have had 1,500 pleasures since I arrived. I do not say I will be able to impart those 1,500 pleasures to the people I represent, but if you ever reciprocate and come down to us, while we are a small population and a small island, our reception will be intensified so as to make you appreciate your visit. The work of these conventions has become so overcrowded that I think it would be very necessary, in order that the whole country get the benefit of the accrued wisdom of the associations of Canada, that we should have some kind of a federation of these councils, and have the different members of them interchange their ideas at some central place. I suggested to Prof Robertson that if we had a federation, with representatives from all the fruit growers' associations over Canada, with the Government footing the expenses, that we would have a large meeting, and have a very good time and do a great deal for the people of Canada. I am sure I shall have the pleasantest possible recollections of this pleasant visit I have had to Ontario. (Applause.)

RESOLUTIONS.

Mr. T. H. Race, in bringing in the report of the Committee on Resolutions, said : Before I say anything in regard to the resolutions of this Association, I would like to submit a matter that has been considered by the members. You are all aware that,

owing to the state of the finances with the Pan-American Exposition mangement, the medals that have been won by our Canadian fruit growers will not be forthcoming. So we thought it would be well to give an expression by this Association, asking the Ontario Government if they, in their generosity, could see their way clear in the way of giving some expression of their appreciation of the efforts of all those fruit growers who have exerted themselves to that extent as to win those awards at Buffalo—that they supply these medals. Now we can scarcely ask the Government to supply all those medals, because there were ten gold medals taken, and a gold medal will cost on an average $170, and $1,700 would be rather a large figure ; and besides the gold medals there were thirty silver medals taken. We thought the Government would not have any hesitation in supplying these thirty silver medals at about $5 each, which would come to about $150 ; and there were forty bronze medals, which would cost about $1.50 each, amounting to only $60; so we would suggest that the Government be asked to supply the silver and bronze medals and do as they please by way of some expression in connection with the gold medals. I will make that motion.

Mr. James Speirs : It struck me that the Ontario Government could not do a more generous thing and a more international love affair than to supply those medals; and from the way the two nations are interlocked at present I think the Government could not do a grander and a more helpful act than to fulfil all the obligations in the medal line that the Pan-American has failed to do. I have read the papers very carefully, and have found that our American cousins have used the Canadian with the utmost generosity in their power, and it would only be reciprocating kindness to award these medals to the Canadian exhibitors. I second the motion.

Mr. Morris : Those exhibitors who took the trouble to send fruit there brought a good deal of honor and credit to this country—(hear. hear)—and not only that, but they went to considerable inconvenience themselves, and I think it is only a small matter for the Ontario Government to give them the medals. I was not able to send any fruit, but did what I could in sending Mr. Bunting roses and flowers from time to time to help to decorate the tables.

Mr. Bunting : I may say in explanation, that I presume, owing to an effort made to be economical in connection with the expenditure over there, the Hon. Mr. Dryden kindly consented to allow me to have the banners prepared which have been distributd here to-day, with the twofold object of recognizing the efforts of exhibitors, and also to bring to this meeting as many gentlemen as possible who had gained awards at Buffalo. I regret that the Hon. Mr. Dryden was unable to be present to assist in the distribution of these banners, as he had intended. It is regrettable that the exhibition people found themselves in such financial distress at the close of the Exposition that they have stated their inability to furnish the bronze medals as originally intended ; and it is now expected that only the diplomas will be issued showing the nature and the grade of the award.

The President : I think if the Government would furnish the bronze medals to all who took bronze medals, silver to all who took silver, and silver plated with gold to all who took gold medals, it would be a handsome thing to do.

Mr. Race's motion was put and carried.

REPORT OF COMMITTEE ON THE FRUIT DISPLAY.

Central Experimental Farm : Collection of 15 varieties of apples, of which Milwaukee and La Victoire are promising for the more northern sections on account of their hardiness and good keeping qualities.

J. I. Graham, Vandeleur : Samples of 10 varieties of standard apples, fine, large, well-colored specimens, grown under the irrigation system as adopted by Mr. Graham.

A. E. Sherrington, Walkerton : 18 varieties of Standard apples, correctly named, large, clean specimens.

W. J. Westington, Plainville : Collection of Northern Spys, fine, well-colored specimens.

Murray Pettit, Winona : Collection of 4 varieties of pears and 4 varieties of grapes, in the new Wilson export package, consisting of a case holding 3 trays, containing 4 baskets of grapes, each weighing about 4 pounds. The pears in a sectional compartment adapted to the size of the fruit ; promising.

C. L. Stephens, Orillia : Collection of apples, containing 25 plates, excellent samples.

R. A. Lehman, Orillia : Samples of 2 varieties of Standard apples

Pan-American Collection : Samples of 52 varieties of standard and newer varieties of apples returned from Buffalo in fairly good condition, also including samples of sweet potatoes and lemons grown in the open air in the Niagara District. Also several good specimens of the Albemarle Pippin and York Imperial apples, as grown in Virginia.

Five cases of 1900 apples, packed by Mr. L. Woolverton for exhibit at Buffalo, opened here after 14 months storage ; 2 cases of Ben Davis, showing 90 per cent. sound and in good condition ; one case of Mann apples, 100 per cent. sound and in good condition, somewhat off flavour ; two cases showing method of packing, apples being wrapped in waxed paper covered with another layer of manilla tissue paper, and carefully packed in case with excelsior between and at top and bottom of case.

Harry Dempsey, Rednerville : Samples of 3 varieties of standard apples, good specimens.

Thomas Spear, Cobourg : Samples of apples and pears for identification.

Richard Cullis, Camborne : Samples of 12 varieties of standard apples.

W. M. Robson, Lindsay : Samples of 6 varieties of apples.

W. H. Dempsey, Trenton : Collection of 24 varieties of apples of the newer sorts and Californian seedlings and one patch of Keiffer pears.

R. L. Huggard, Whitby : Collection of 10 varieties of apples and 13 of pears.

J. W. Bigelow, Wolfville, N.S. : Collection of 9 varieties of standard Nova Scotia apples, sent from the exhibit at Buffalo, large, well-preserved specimens.

W. C. Reid, Belleville : Five varieties apples.

W. H. Bunting,
W. T. Macoun,
F. A. Waugh.

ST. LOUIS EXPOSITION, 1903.

The Secretary : A paper was left with me by Mr. Harold Jones, who has had to leave, on "Organized Effort in the Fruit Exhibit for the Louisiana Exposition in St. Louis, 1903." I think a resolution ought to be passed by this Association, so that if anything is to be done in St. Louis in 1903 we may get to work in good time, so that we may do quite as creditably, if not more so, at this exposition than we have done in Buffalo.

Mr. Race : You will remember that when the Pan-American question first came up there was some objection raised to making any display there, some being quite opposed owing to the trade conditions existing between the two countries, but that had a very small limit indeed, and many of those thinking otherwise moved that a very extensive and a hearty organized effort be made for the display, and you see the results what an honor it has been to this great Province of ours ; and since I am Chairman of the Resolution Committee I would move that this Association give its expression in favor of a very active organized effort being made by the Province of Ontario to make a large and attractive exhibit of fruit, and everything in the line of fruit, at the coming Exposition at St. Louis, so that we might win still greater honor there than we have won at the city of Buffalo.

Mr. Stephens (Orillia) : It affords me great pleasure to second the motion, and I am sure if we make such an effort as we can make, we will not only beat all the other States, but New York State also.

The resolution was put and carried.

PRUNING.

Mr. A. McNeill : As the person who interrupted Mr. Hutt, I have this to say, that I have never heard a lecture of a better type before our Association since it began, that is, of the educative type, and I can assure you it was not for want of appreciation of it that I interrupted at that moment. I hope that kind of thing will go into every school in this country. Let us have more of it.

Mr. W. N. Hutt : I feel like apologizing to this audience for appearing before you again. It seems to me somewhat like an imposition, but if you have any questions on this subject I will be glad to answer them as far as I am able. Of course it is a big subject, and one can only give his experience about it as far as he sees and learns. I think there has been a wrong impression, confusing me with my brother. I am not a professor at all, but a fruit grower from the Niagara district. I was speaking, when I left off, about the length of limbs cut off in what I call a proper manner. When cut off too long it results in a badly healing wound. Where there is a bud you get suckers or water sprouts. A water sprout or a sucker will start where there is a wound. That is Nature's method of healing the wound. Those suckers tend to heal over that wound. But if there is no bud there the limb should in all cases be cut off as close to the trunk as possible, because it is from the main trunk that we get the healing process ; that is, the cambium is the part that causes that growth, and the closer you can get to the place where that healing begins, the better. How many orchards in the country will you find with just such bad pruning as this shows, the great stubs sticking out and very little chance to heal over ? We do not approve of cutting off very large limbs, except under certain conditions when it is unavoidable, but if a tree is started rightly you will never have to come across difficulties of that kind. In trimming trees we want to get something that will make a good smooth wound (holding up a pruning saw). The advantage I find with this saw is that it has a stiff back, making the blade perfectly rigid, which can be brought up with a set screw. That will make a good close cut where the saw will not get a chance to wobble. Of course the teeth of the pruning saw are fine, and well set so that it cuts rapidly. There was a blade on the end for jabbing, but that is a very poor tool, because you will make two or three strikes before you hit in the right place, and those make two or three wounds, and you get two or three suckers to heal over those wounds. The saw is in all cases the best tool to prune with, and makes very little injury to the cambium in cutting, and that is the important part of the tree, for that is the part we get all our growth from, and want to take the greatest care of it. Some might say, "What about the pruning shears ?" They are all right under certain circumstances for smaller limbs, when there is not much resistance in cutting it off, but take the limb of an apple tree where the wood is hard, in order to get that limb off you have to work the shears often, and you work the bark off there, bruise the cambium for an inch, and the wound heals very slowly. We use a long handle on the saw for high trimming. The question was brought up this morning about paring wounds. That is not necessary, because you want to have the cambium protected as much as possible, and if you pare down it will allow the frost to get to the cambium. As all growth takes place from the cambium of the tree, we want to make our wound at a time when that cambium is making an active growth. You will in all cases get the best healing wound in trimming at that time ; that is, in the spring of the year, say, when the sap is circulating. You will be surprised to find how soon a wound will heal. In a very few days you will see the growth coming up between the bark and the wood. Here is a wound showing in cross section, a wound about four inches long, and you can see how the cambium has grown up to heal over the wound. In this case (shown) you have the process almost completed; and here (shown) is the final result, completely healed over; and where you have it healed over in that way the danger to the tree is passed, the wound is entirely gone.

Mr. McNeill : In case decay has set in before the healing is quite complete, will the decay go on after the wound is healed ?

Mr. Hutt: Yes, I think so. I made investigations on trees to find out about that, and cutting them down you will find in some cases that decay has entered into the tree to a certain extent, though if it is completely healed on the outside it is reduced to a minimum. On trees that are vigorous a wound of a reasonable size, say, a wound of an inch, or an inch and a half, will rapidly heal over without any assistance, but in making all large wounds I think it is an advantage to paint them over. Some people object that they do not heal so fast for painting, but my experience is that, though they may not heal so fast, at any rate they heal more satisfactorily, because if you take a wound 2½ inches across, the probability is that unless the tree is growing very rapidly, before the wound is healed over the wood-destroying fungi will have entered at the end and softened the wood, and the limb will rot down to the tree, so that I usually paint them over. A very important thing as regards the healing of wounds is in spraying them well. Spraying has a special advantage besides its usual purpose of stopping the fungous diseases on the fruit itself; that is, these diseases of fungus plants that rot the wood of the tree. In spraying in the orchard I take great care to spray the trunks of the tree, and particularly those wounded surfaces. As the Bordeaux mixture is a fungicide, and as plants or fungi that destroy wood are active here, you have a chance to destroy those germs that have entered on that wood. By spraying them, and then covering them over with paint when they are dry, you will find that that wood will be very hard and last much longer than it would if left open and exposed to rain, which gives a better condition for those fungi to work on the wood and destroy it. Painting would hinder the checking of the wound.

Col. Roger: Did you ever use gum shellac for that?

Mr. Hutt: No, I think it would be a little expensive.

Col. Roger: It is very effective.

Mr. Hutt: It would be a very good thing. What I use is lead paint, just lead and oil, the thicker the better. I have examples of pruning where the limb is cut too long, causing a badly-healing wound, and finally the death of the limb. Here is an example of a torn wound. The limb has been cut off carelessly, probably from the wrong side, and the result of that is that the limb is rotten at one end, the little fungi growing at the other side having rotted the wood. Where it is necessary to take out very large limbs, and where the limb is very heavy, it is difficult to cut it off without tearing it down or splitting it in some way; in that case we usually cut in and then put the cut above to meet it, and then the end breaks off with its own weight, and then you can saw the stub off afterwards.

Mr. Morris: I agree with Mr. Hutt in most of what he has said regarding pruning, but there is one thing in which I do not. My experience and observation, and I think that of all nurserymen, is that you should cut that just above the shoulder. The wound is only about one-third the size, perhaps not that, and it will go on healing there just as quick as though it was cut close to the tree, and it will heal in one-third of the time that it would if cut close to the tree. Now I know nursery workmen that will take off that shoulder. We have to watch them very carefully, check them, and sometimes even discharge them if they continue that.

Mr. Hutt: I am afraid you would have to discharge me, then, if I were around. I know that is a great point of dispute; but you take the extreme case here, and you cut down; where is your line of demarcation ?—and as long as you leave any stub you will find there is more or less decay. Now, I go to the other extreme. I do not cut that off where the healing starts. If you have not stopped the circulation, the sap will cause that to heal there, but I find—and I have practiced this for quite a long time—I can get a better result by cutting closely, even though the wound is large.

Mr. Morris: With a thrifty growing tree it is not a matter of much importance, it will heal over anyway; it is only a difference of opinion as to which is better. There is another question that I would like to refer to Prof. Van Deman. He and Prof. Waugh advocated low-headed trees, while Mr. Hutt was speaking in favor of tall and high-stemmed trees. My observation leads me to believe that a low-headed tree or a low-headed orchard makes a far better orchard than a high-stemmed tree. He quoted

two limbs of the Greenings coming down. Well, now, they will come down the same way on a tree if the stem is 10 feet high. My model of a tree would be a stem perhaps four feet, and then train your first limbs up and you get your head just as high as the other way. These limbs that you start low tend to shade the trunk. It is very important to keep your trunk healthy, and with those tall-stemmed trees you cannot do it, the wind bends them over. Here we have prevailing in most parts of Canada southwest winds. When the soil is wet those winds blow those trees and lean them to the northeast, and just as sure as they get leaning to the northeast that tree is going to die every time. The sun will burn them on the southwest side, and then perhaps the borer gets in, and suckers will start from the bottom and the tree will soon die.

The President: Then you believe in sun-scald ?

Mr. Morris: I believe in sun-burning. The sun will burn when the tree gets that size (showing). If the sun will strike that on the southwest side that tree is going to die.

Prof. Van Deman: I do not think there is any difference of opinion between any of us that have talked here and those that they have talked to in regard to that matter of sun-scald. It is merely a name. We may differ in the interpretation of the name. I do not think that any of us believe that the sun actually cooks the sap or cooks the living part of the tree, but the damage is there, and we call it sun-scald. Of course it is the effect of the violent changes in winter time when this thing occurs. That is the whole cause of the trouble, and we say it is sun-scald. Of course the sun has an effect on it, it is the original cause, and if the tree is thoroughly shaded by some of those tree protectors, or even by the branches sometimes, though they may be stripped of leaves, they are sufficient to prevent any trouble of that sort. In regard to the matter of high-headed trees, I am fully convinced that a low-headed tree is best, but I would not say that it should be so low that there was no possibility of getting any tool under the branches, and I perfectly agree with Mr. Hutt in having trees trained at such a height that it is possible to get a low running instrument under the branches. Of course up next the body of the tree after it reaches bearing age there is no real necessity to stir the ground. There is nothing but large roots there then, and the shading of the tree will necessarily keep down all vegetation, and the thing will regulate itself very well, but I do not believe in this horse-high pruning, so that we can drive a waggon under it and all that sort of thing. That is what I am objecting to. I would rather have the good common sense of any ordinary person than I would all the hifaluting notions of people that have fancy ideas about pruning. Now, Mr. Wellhouse of Kansas is perhaps a little extreme in his ideas about orchard pruning; he does not prune but very little, and one of the first things that he asks any man that is to be hired to work in his orchard is, whether or not he is a good pruner. If he says yes, Mr. Wellhouse replies, "I do not want you.' He does not want anyone with any preconceived notions, beause then they are sure to do what they think instead of what he thinks, and so he would rather have somebody that knows nothing about the business, and then they are in that instructive state of mind; and I think that is the policy that we ought to follow out in a reasonable manner here or anywhere—to get people who will prune according to our ideas. We want to be sure to have our ideas right, and not to get any of those fancy Old Country pruners who know it all; they are just the ones that will do lots of damage, and as Mr. Hutt said this morning there are a great many people that judge their skill at pruning by the amount of brush they make—the more brush the more skill—and that is the worst kind of heresy. As to the place at which to cut off the branch in pruning ,I may say that pruning is vegetable surgery, and should never be performed except when there is absolute necessity, any more than we should have one of our limbs cut off.

The President: There are no new limbs coming out on us.

Prof. Van Deman: No, and it is with great difficulty we can have a new one when we cut one off a tree. I would try to make the wound as small as I could, to remove all of that branch that we do not need, and I would get just as close to the tree as I could without actually scoring the body of the tree. (Hear, hear.) That one

here (showing one close to trunk) is to my notion. I would not cut right jamb up to the tree, but I would begin exactly in the fork, and I would cut so that I had very little slope upwards, and you will find that wound will heal over better than a wound like this. (Showing).

Col. Roger: If you had a tree and you found you had to cut off a branch as large as this (about 2 inches), and the sap were flowing freely, and you were afraid that sap would flow down here, would you consider it necessary to cut that down half a foot or so, and afterwards cut it off ?

Prof. Van Deman: No. It won't hurt a grape vine to cut it if it bleeds so that it runs like a maple tree in the spring time. I have left them till then and pruned them then to see, and it makes no difference. There is nothing but a little water runs out.

Mr. Morris: Is it as good to prune a grape vine, then, as it is in the fall ?

Prof. Van Deman: Oh, no; I would not want to do it. You are in danger of breaking the buds and all that sort of thing.

Col. Roger: It is not desirable to prune when the sap will run, but sometimes you have to do it.

Prof. Van Deman: If I had my choice of the time of year to do the pruning of apple trees and pear trees it would be just about midsummer, as a rule. When you prune when the leaves are off it will invigorate the trees; that is, it will cause them to send out a lot of water sprouts. If you prune in the summer time they will not grow, and the wound will heal over quicker there than if you prune at this time.

Mr. J. Tweddle: What about the loss of foliage ?

Prof. Van Deman: That is nothing. I do not believe in pruning a tree till you really hurt it.

Mr. Morris: Would you get into the trees at that season ?

Prof. Van Deman: I would not want to climb into the tree, I would want to stand on the ground. Of course big trees are another problem. As to the saw; I should have one of those stiff-backed saws with a little narrow blade. A medium sized butcher's saw is the nicest thing for grafting or pruning that I ever tried. I want this so that I can screw it up and make it as tight as I like. There is no sense in trimming off that wound. I would just as soon leave it as the saw leaves it as any other way, and paint it over and leave it that way. I want to say one thing more on the matter of grafting. If I pride myself on anything in horticulture it is being able to graft well; and since the spring of 1867, when I found out the right way to graft, as I call it—top grafting—I have never made a square cut. I always cut at the angle of 45 degrees, and put in one scion. I never cut a branch so big that one scion would not be sufficient. Even if it is 2½ inches in diameter I just put in one scion. I just begin at the top and saw it right down at a very sharp angle, and then with my knife I cut off the top and put my scion on there. Lots of times you can set that graft without ever making a crack.

The President: It is a cleft graft.

Prof. Van Deman: Yes; I graft a great many ways, but that is about the best way.

Col. Roger: What wax do you use ? How do you make it ?

Prof. Van Deman: I use one part of tallow, two parts of beeswax, and four parts of resin. That will make a wax that will work in almost any weather when you are able to do grafting. You can remember it thus—1, 2, 4.

Mr. Caston: When you graft on a limb as large as that, suppose you were working on the top of a young tree, how would you go out farther on the limb ?

Prof. Van Deman: That would depend altogether on the tree. If it was a very small tree I might cut the whole thing off and just put on one scion and have a straight scion of it, but as a rule I would rather go up to where I had several scions to put in and make them smaller. Rather than cut the great large limb like my arm I would go higher. Never cut off closer to the fork than about 4 inches, because if you happen to fail you can let a few sprouts grow on that, and the next year you have room to make another cut a little farther back.

The President: Would you prune at this time of year?

Prof. Van Deman: Yes.

The President: Would you prune pear trees?

Prof. Van Deman: Yes.

The President: And plum?

Prof. Van Deman: Yes, I might.

The President: Just as readily as you would apple?

Prof. Van Deman: I think so; I have done it, and I have pruned peach trees at this time of year, although I usually prune peach trees pretty well towards spring time.

Col. Roger: I like to begin to prune just as soon as the blossoms have dropped off the tree.

Prof. Van Deman: That is all right.

Col. Roger: My object is to destroy as little as possible of the growing fruit.

Prof. Van Deman: Well, you cut the fruit off when it is in the bud in the winter time.

Colonel Roger: But I am not so apt to disturb the other fruit.

Prof. Van Deman: You do not seriously hurt anything.

Col. Roger: It is better to do it then than to leave it later.

Prof. Van Deman: No, if I had my choice I should do the pruning on my apple and pear trees in midsummer, about the end of June or the middle of July.

Col. Roger: I think one of the best things I ever invented for orchard economy is what I call the wheeled step ladder. I made a special ladder, and instead of letting the front legs run to the ground I mount the front legs on two old buggy wheels and run an iron axle through, and then put the handles back here so that I can lift the whole thing up like a wheelbarrow, and I have a platform to carry my tools on. and I wheel that thing around, and I run up on the sides and stand on that instead of the tree, and I can reach all round the tree, and when I get one side done I wheel it around to the other side; and when it comes to picking apples I have three sizes of those step ladders, from 5 feet high to 12 feet high, and I can put a man on that step ladder and he will pick twice as many apples than if he used the ordinary step ladder, and he does not injure the tree. I will send you a photograph of that step ladder if you like. I do not want to patent it. I have mentioned it here because I know people will say that is a good idea.

HYBRIDIZING NUTS.

By Arthur Harvey, Toronto.

I wish you to bring to the notice of your convention the subject of hybridizing nuts. I have some right to ask your attention to a subject of the kind, because I have a long experience. When Secretary of the Horticultural Society of Hamilton, in the fifties, I remember urging the cultivation of tomatoes! Again, I was a pioneer in grape culture, and it is curious to think that forty years ago there was not a ton of grapes grown for the market, let alone wine-making. And, apropos of this, let me say that so long as we depend on the hybrids of Vitis Labrusca we shall never make a good, palatable wine; we have to begin over again from the Vitis Riparia, to get rid of the foxy flavor, and if we can get that other hybrid early and sweet enough, we shall do. However, to our nuts. I have tried in vain to hybridize the native hazel with the English filbert and the Kentist cob-nut, both of which I grow, but they do not flourish. I understand the botanical difficulty. The Ottawa Experimental Farm folks have tried, too; I have sent them pollen three times; no use. I think it may be done yet, and why do not some of you clever folks try it? Again, I have tried to grow the English walnut, but it is too tender. I have tried to graft it on our native black walnut, but, so far, no result. I shall try again. Why do not some of you try to hybridize the English walnut and our native kind? Mr. Pafford of Niagara has an English walnut in good bearing, and I am sure you could get his help. What a benefit it would be to our country to

have a nice soft-shelled fruit instead of the hard, thick-shelled nut which it takes a squirrel or a pig to get the kernel from !

Prof. Van Deman : The Persian or English walnut has been crossed with the Ontario walnut of California by Newton Burbank, and there is a little progress made, but with the common Eastern walnut it has not been crossed as far as I know ; but there are varieties of that European walnut growing now in the vicinity of Buffalo. Down at Lockport there is a large bearing tree. It will grow in Canada if you only get the hardier varieties.

VOTES OF THANKS.

Mr. T. H. Race : I am never in favor of votes of thanks in any form or way. I do not believe in a formal vote of thanks ; I believe that if thanks have any value the expression should be spontaneous; and we have no resolutions at all written or framed, but I would move, since we have had abundant reason to feel spontaneously thankful to the people of Cobourg, that the gratitude of this Association be expressed and tendered to the people of this beautiful Town of Cobourg for the splendid accommodation they have afforded us in all our several meetings since we came here.

The resolution was seconded by Mr. Scarff and carried amid applause.

Mr. Race : Our committee would also move their hearty expression of their appreciation of the efforts put forth by the local Horticultural Association in recognition of their splendid efforts and energies to make this gathering such a success as it has been. We see the results of their efforts in the several sessions of this meeting, and I think it is due to them that we should give a strong expression of our gratitude and appreciation of all they have done in developing and creating an interest throughout this district in behalf of this meeting.

Mr. A. McNeill : I would second that motion, and couple with it just a suggestion that this might be taken as a lesson in what can be done by an organized effort. It certainly was a splendid performance, and the thousand and one little courtesies that would scarcely strike the average stranger have been appreciated by the members of this Association most heartily.

The resolution was carried by a standing vote amid applause.

The Convention then adjourned.

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REPORT

ON THE

ONTARIO FRUIT EXHIBIT

AT THE

PAN-AMERICAN EXPOSITION

1901.

APPENDIX TO THE REPORT OF THE FRUIT GROWERS' ASSOCIATION.

(PUBLISHED BY THE ONTARIO DEPARTMENT OF AGRICULTURE, TORONTO.)

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REPORT OF THE ONTARIO FRUIT EXHIBIT

AT THE

PAN-AMERICAN EXPOSITION BUFFALO N.Y. 1901.

REPORT OF THE SUPERINTENDENT.

Mr. C. C. James, Commissioner for the Province of Ontario :

Dear Sir,—I herewith have the honor to submit to you a report of the progress and results of the work under my supervision in connection with the Ontario Fruit Exhibit in the Horticultural Department at the Pan-American Exposition.

Upon receiving the appointment of Superintendent of the Fruit Exhibit for the Province, in the month of March, arrangements were at once set on foot looking to the preparation and instalment of an exhibit which might be calculated to advertise the climate and resources of Ontario, and to maintain the high reputation which the Province had already gained for the production of the fruits of the temperate zone in the greatest profusion and of the highest quality.

I found that no extensive preparations had been made during the previous season, with a view to exhibiting in horticulture at Buffalo. However, under instructions from the Department of Agriculture of the Province, Mr. L. Woolverton, of Grimsby, had secured and packed in the most careful manner about 200 boxes of apples, comprising thirty of our standard fall and winter varieties, and had placed them in the hands of the Buffalo Cold Storage Company, to be held until required for the tables. This fruit proved most satisfactory in all respects, and clearly demonstrated the great possibilities of cold storage for our apples in seasons of large supply.

This subject will, however, be more fully taken up in another section of this report.

A circular was at once issued to the fruit growers and packers of the Province, soliciting contributions and co-operation in connection with the installation of the Exhibit. This was responded to quite freely, although in many instances it was stated that no material assistance could be rendered until the season's crop should be ready. A number of firms, notably Messrs. Shuttleworth & Harris, of Brantford, manufacturers of pickles and relishes ; the Ontario Grape Growing & Wine Manufacturing Co., of St. Catharines; the J. S. Hamilton Company of Pelee Island and Brantford; the E. Girardot Wine Company of Sandwich, all of whom are manufacturers of native wines ; L. M. Schenck & Co., of St. Catharines, manufacturers of canned goods; A. Bain, of the Springbank Mineral Water Company, St. Catharines, and R. J. Graham, of Belleville, manufacturer of evaporated and dessicated fruits and vegetables; requested space in the allotment at our disposal, which was granted, and resulted in each of these firms setting up an exhibit, that proved of value to themselves, and added a great deal to the general appearance of the entire display.

The Spramotor Company, of London, had also requested space for the installation of their exhibit, but owing to the crowded condition of the section it became necessary for this company to set up their display in the North Conservatory, adjoining the Horticulture Building, where it attracted a great deal of attention.

The Horticulture Building, which was rectangular in form, was divided into sections radiating from the centre, giving a very unique and pleasing effect and bringing every exhibit into almost equal prominence. The larger portion of Section M, south of the main aisle was alloted to Ontario ; the State of Wisconsin occupying the remainder. The State of Florida and the exhibit of Los Angeles Co., Southern California, occupied the sections on either side, the contrast between the exhibits of these semitropical countries and those from the Province of Ontario was very striking, and the effect produced upon the minds of visitors was most favorable to our Province. Including Nova Scotia and Mexico there were forty-one States and countries exhibiting in the Horticulture Building, under the superintendence of Mr. F. W. Taylor. I am pleased to say that our relations with the representatives from these various countries was at all times of the most cordial and friendly nature ; and while between ourselves and many of the northern States, there was more or less competition, at no time did this friendly rivalry give rise to any ill feeling or misunderstanding.

It was deemed advisable that the general appearance of the exhibit and the installation connected therewith, should be in keeping with the prominent place which it was expected Canada would take at the Exposition. With this end in view a plan of arrangement was adopted which proved very satisfactory, and resulted in the erection of a facade and series of pedestals and tables, which displayed the various exhibits to good advantage, and elicited many favorable comments from visitors from all parts of the world. In this connection special reference may be made to a series of carved projections representing typical cornucopias overflowing with fruits and vegetables indigenous to the Province. This piece of work was carved in relief by James Carty, of St. Catharines, to whose skill and mechanical ability a large part of the credit of the entire construction was due. All the work connected with the installation of the exhibit was performed by Canadian workmen, under contract from Canadian firms, and certainly brought no discredit on any of them, when placed beside the workmanship of the best thought and skill of American builders engaged in the construction of booths at the Exposition. The general construction was supplemented by and embellished with a number of silk banners, including the Union Jack, the Royal Ensign and the Dominion and Ontario coats of arms ; in addition, a number of appropriate pictures and fine specimens of mounted deer's heads and native birds were kindly loaned by the Department and by several patriotic gentlemen from St. Catharines. As will be noted elsewhere, an award of a Silver Medal was made by the jury in this department for "Installation of Exhibit," similar awards being made in this building only to the State of California.

One of the greatest factors in the embellishment of the tables during the entire season, and one in which it may be said Ontario excelled, was the continuous display from May 20th until the closing day of the Exposition, of large quantities of cut flowers and ornamental plants. For this feature we are indebted largely to Mr. Wm. Houston, Florist at the Central Prison ; Messrs. Morris, Stone & Wellington, of the Fonthill Nurseries, and Mr. James Wilson, Superintendent of Queen Victoria Park, who, through Mr. Cameron, sent in continuous displays from week to week. It is to be regretted that these gentlemen, through a technical oversight, failed to receive from the Exposition Jury, the recognition to which their displays entitled them.

In giving a summary of the exhibits of the various fruits as they came in season, it is well to bear in mind that owing to the perishable nature of a display of fruit, the aspect of the exhibit would naturally change from day to day, and it required constant attention and unremitting effort to maintain the high standard that was aimed at, and that was to be expected from the Province of Ontario.

Fruits in glass. This display, for reasons previously stated, was of moderate extent. A central pedestal was erected, and on this was placed some three hundred jars of domestic canned fruits, obtained from a number of fruit-growers throughout the Niagara District. This exhibit was supplemented later by a very excellent collection of strawberries, raspberries, gooseberries, and currants, in solution, prepared by Prof.

Hutt of the Ontario Agricultural College. These fruits, together with exhibits from Mr. Caston, of Craighurst, Mr. Woolverton, and Rev. E. B. Stevenson of Jordan, proved very interesting and instructive.

Strawberries. This was the first fruit of the season's growth to make its appearance on our tables, and while supplies were sent in quite early to some of the exhibits from the more southern States, Ontario displayed strawberries fully a week before the State of New York, and for some time kept far in advance of that important State, with regard to this most beautiful and valuable fruit. In all there were over forty varieties of strawberries displayed, a list of which may be found at the close of this report. The season lasted from June 11th to July 6th, and during this time a large and attractive display was maintained. A new strawberry, named the Ryckman, appeared upon the tables of Chautauqua County, New York, which gave promise, as likely to prove of great value.

Cherries. Owing to the almost entire failure of the cherry crop in the Province, the display of this fruit was not large ; only fifteen varieties were exhibited and the principal contributors of this fruit were Messrs. Orr of Fruitland, Stewart of Homer, and Orser of Bloomfield. The cheeries sent in by Mr. Orr showed the benefit to be derived from regular and sytematic spraying, as the fruit was invariably in perfect condition. A very large black cherry, named the Bing, was shown by some of the western States, and attracted a great deal of attention, and the Windsor, a Canadian seedling, also took a very prominent place. These cherries are worthy the notice of our fruit growers generally. The cultivation of this fruit, both sweet and sour, may very well command more serious attention, as the market is far from being fully supplied.

Raspberries. The Cuthbert, amongst the reds, and the Gregg, from the blackcap family, carried off the honors for this fruit, both in quantity and general good qualities ; about ten varieties were exhibited in all; of the newer kinds the Louden seemed to be the most promising.

Blackberries. In this fruit the display was somewhat limited; about seven varieties were shown, the chief of which were Lawton, Kittatinny, and Snyder. A most magnificent blackberry was displayed by New York State from time to time, called the Rathbun. It is of enormous size, beautiful appearance, and excellent quality ; possibly it may be somewhat tender.

Currants. Considerable competition arose in connection with this fruit, as the supplies were plentiful, and the quality and appearance quite up to the standard. During the season our tables were abundantly supplied with choice plates of Cherry, Fays, Wilder, White Grape, and Black Naples, with occasional contributions of over twenty other kinds. The Wilder currant is considered by our New York friends as a most valuable variety on account of its size, productiveness and ability to hang for a great length of time on the bushes. A new climbing currant, called the Chatauqua, gave promise of being worthy of propagation.

Gooseberries. The exhibit of the large varieties of Gooseberries, which was made by Ontario quite eclipsed any shown in the building during the season. The enormous size of the specimens of Whitesmith and Industry that were shown by Messrs. Merritt, Beattie, and Sexton of St. Catharines, proved a source of astonishment and wonder to the visitors from the south, while to those from Great Britain, they seemed to bring back recollections of the English Gardens. In addition to these very large fruits, fine specimens of over thirty other varieties were shown. The displays of Messrs. Stanley Spillet, of Nantyr, and C. L. Stephens, of Orillia, deserve special mention.

Plums. The plum crop of the Province was quite uneven the past season, and some large plum sections experienced quite a failure ; however, from a number of constant exhibitors, a continuous display of plums was kept up, extending from July 30th until the middle of October. In all eighty varieties were shown during this time. Considerable interest was manifested in the samples of the newer varieties of Japanese plums, grown and exhibited by James Titterington of St. Catharines, of which, perhaps,

Wickson, Paragon, Shiro, Climax, Gold and President, were the most interesting, all being from large to very large in size, and most beautiful in appearance. Exhibits of plums were received from nearly every fruit section in the Province, and were probably representative of a greater numbr of localities than any other fruit shown.

Peaches. Much to the astonishment of exhibitors from the various States, Ontario took a most prominent place during the peach season, again displaying samples of home-grown fruits some days in advance of New York State. Michigan, which was fortunate in having a very heavy crop in many sections, proved our strongest competitor, and made a most excellent display of peaches at different times. The Ontario tables were, however, from the time that the Alexanders first made their appearance until the close of the Exposition, never without a creditable showing of this valuable fruit, and at times the display was large and remarkably fine. In all some sixty-three varieties were shown from time to time. The exhibit of this fruit no doubt accomplished a great deal towards enlightening the minds of those who had not given the subject careful thought, as to the climate of the Province and the large area in Ontario over which so valuable and tender a fruit as the peach may be successfully and profitably produced. A few of the most valuable yellow peaches not generally known may be said to be Engol's Mammoth, Chair's Choice, and Fitzgerald, all ripening their fruit later in season than Early Crawford. A new yellow peach named the Purdy, a Canadian seedling, was considered by the judge of fruits as very promising.

Grapes. Supplies of grapes came in quite freely from the time the season opened until notice was sent out to cease forwarding. In all over 100 varieties were placed on exhibition. It is the general opinion, however, that the list may be cut down very considerably, and still comprise those kinds which have proved of exceptional value. In addition to outdoor grown grapes, several choice varieties of house-grown grapes were shown, contributed from the houses of Thomas R. Merritt, of St. Catharines. With the single exception of apples, no other fruit on exhibition took so prominent a place with us as did the grape. It was universally admitted, notwithstanding the fact that large and varied displays were sent in frequently from the grape sections of the United States, that for size and beauty of cluster, for variety of fruits, for quantities displayed, and for the general excellence of the exhibit, Ontario grapes stood in the front rank. The full and complete collection shown by Mr. Murray Petitt of Winona, which captured a Wilder medal, and the beautiful clusters from the vineyards of Mr. F. G. Stewart of Homer, and Mr. Albert Pay of St. Catharines, were especially fine, but the exhibits in this class were so numerous and of such uniform quality that individual mention can scarcely be made. A Canadian seedling named the Lincoln, originated by the late W. H. Read of, Port Dalhousie, drew the attention of many of the largest grape-growers of the United States as giving evidence of valuable qualities as a commercial grape.

Pears. This display was well maintained and a fully supply of seasonable varieties were furnished from the Whitby and Burlington Districts, from the west, and also from nearly every exhibitor in the Niagara District. Fifty varieties were shown during the season. Owing to the favorable prospect for the successful exportation of this class of fruit, a great many fruit-growers are turning their attention to the production of pears that may prove suitable for this purpose. In the case of this fruit also a great many varieties may be without much hesitation laid aside, and attention confined to the growth of those kinds which give promise of meeting the demand of the English market. The export trade in pears is likely to assume large proportions, and only such varieties as the Bartlett, Duchess, D'Anjou, Bosc, Louise Bonne, Clairgeau, and possibly the Keiffer, should be planted on a large scale. The market for pears in this country is fairly well supplied at the present time ; pears occasionally selling for less than good varieties of apples at the same season. It would appear, however, that a large market for the right kind of pears is opening up in Great Britain, as soon as shippers can be assured of reasonably safe transportation. Messrs. Vanduzer & Griffith,

of Grimsby, exhibited a case of choice Bartlett pears packed for export, which attracted the attention of many large fruit-growers and shippers.

Quinces. A few choice samples of this fruit were shown, in some cases the specimens being extremely large and fine.

Apples. Notwithstanding the fact that Ontario prides herself in producing fruits in great variety, the apple, after all, is the fruit par excellence in this Province. It was with respect, therefore, to this fruit that the other exhibitors were especially anxious to learn what position Ontario would be likely to take amongst them all. It certainly is a source of satisfaction that notwithstanding the very great failure of the apple crop the past season, and the somewhat limited preparation made in 1900, for this exhibit, we were able after all to take our rightful place amongst the large apple producing sections of the United States. Commencing with a display on May 20th of some 700 plates of apples, comprising over thirty varieties, taken out of storage in as fresh and perfect a condition as if just picked from the tree, we maintained an exhibit of fruit of the previous season's growth right up to the close of the Exposition, and had at that time apples in reserve, of which, when the cases were opened at Cobourg in December, from 92 to 100 per cent. were found to be still in sound condition, after fourteen months' storage. The object-lesson was an extremely valuable one, conclusively proving to thousands of fruit-growers, both Canadian and American, not only the excellent keeping qualities of Ontario fruit, but also the vast possibilities that there are to be found in the intelligent, careful harvesting of the apple after it has been well grown; and that it is not at all necessary in seasons of extra large supplies that so much of this valuable crop should be wasted for lack of market for it in the fall. Let the apples be carefully gathered and packed in proper season and immediately placed in suitable cold storage, and the owner is at once master of the situation. It must be remembered, however, that cold storage will not work miracles. It will not restore fruit that has been bruised or badly handled, or allowed to become over-ripe ; but if the initial conditions are carefully attended to, it is quite possible to find after six to eight months' storage that the fruit is still in excellent condition. It does not follow by any means that fruit so packed, and held the length of time mentioned should of necessity fall down immediately it is exposed to normal temperature. Apples of this class were placed on the tables time and time again in the hottest weather, and their keeping qualities were remarkable, the fruit remaining in good condition for weeks after removal. With the exception of New York State, Ontario's exhibit of 1900 apples was superior to any other in extent, variety, and economic value of the kinds shown. Although in many sections of the Province the crop of 1901 was an absolute failure, still the Province is so large and the conditons are so varied that it was possible even in such an "off" year to fill up the tables with specimens of fruit that for quality were unexcelled. Over one hundred and forty different varieties were displayed in September and October, and our space became so crowded that we were compelled to obtain extra accommodation in which to extend our exhibit. During the meeting of the American Pomological Society, and in connection with the competition for the Wilder medals, in addition to a number of extra tables furnished for the purpose, the State of New York kindly permitted the use of a portion of their space for the display of the Experiment Station's Exhibit. At a later date a large stand, surrounding one of the main pillars of the building, was made use of as an overflow exhibit. While there were many exhibitors of apples, special mention must be made of the fine displays sent in by W. H. Dempsey of Trenton, R. J. Graham of Belleville, Wm. Rickard of Newcastle, and Prof. Macoun of the Central Experimental Farm, all of whom were recipients of honors. No doubt a great factor in the improvement of the quality of our apple product is due to the almost universal practice that now obtains of spraying the trees during the season, and it should be a matter of congratulation amongst our growers to learn that a spraying outfit of Canadian manufacture received the highest award and only Gold Medal granted for spray pumps at Buffalo. This award was made to the Spramotor Company, of London, whose exhibit was well worthy of the attention it secured.

Miscellaneous. Under this head may be placed the exhibits of nuts, tropical fruits and vegetables that were sent in from time to time. Special mention may be made of the exhibits of melons and tomatoes, which for quality was not excelled. Canadian tomatoes ripened out of doors were displayed at a very early period, again showing our climate in a most favorable light.

While it became necessary to secure occasional supplies of fruit by purchase, in order to keep a full display of fresh and seasonable fruits before the public at all times, it is certainly due a large number of public-spirited and patriotic fruit growers and shippers that reference be made to the hearty manner in which response was given, from time to time, to calls for supplies; this was so universal that nearly every section of the Province was to a greater or less extent represented, and it is largely owing to this fact that the Province of Ontario again, as on previous occasions has taken her proper place as a land blessed with a climate most magnificent, a soil most fertile, and a people most patriotic and progressive.

It became every day more apparent that it was a wise conclusion on the part of the Department of Agriculture, when it was decided to place an exhibit of fruit in the Horticulture Building; in fact, a serious error would have been made had this been omitted. Valuable and important as her other exhibits of the forest and the mine undoubtedly were, there was no display that seemed to catch the popular eye or fasten the attention of the public on Ontario so frequently as that of her fruit, and there is nothing else that can impress upon the mind so forcibly the conditions of climate and environment. In this respect Ontario scored a complete success, as was attested hundreds of times by the exclamations of wonder and delight that were given expression to by visitors from day to day. The Ontario section was also a headquarters for Canadian visitors, and special efforts were put forth in this respect so that every Canadian was made to feel that beneath the flag of his native country there was a welcome and sense of restfulness and solid enjoyment which he could find nowhere else as fully or as well. There is no doubt that we will also profit to no small extent by an influx of progressive cultivators of the soil, men who were favorably impressed with the possibilites and resources of Ontario from the standpoint of the orchardist and fruit-grower.

In tangible results the fruit exhibit received from the Juries of the Pan-American Exposition, awards of twenty Gold, thirty-five Silver, and forty-four Bronze Medals, and one hundred and sixteen diplomas of Honorable Mention, in recognition of the value and importance of the exhibits.

Comparisons are unnecessary. It may be said, however, that this record was far in advance of any other State or country, with the exception of New York State.

It is scarcely necessary that I should do more than refer to these very important results, inasmuch as full details have already been published broadcast by the press and are generally well known. I trust, however, that the efforts put forth by the fruit-growers of the Province to represent Ontario's Horticultural interests at the Pan-American Exposition may be productive of lasting good, and may prove an incentive to further achievement.

In closing, permit me to refer to the uniform courtesy that was extended to your representative by the Exposition officials and the Customs officers during the entire season, and to express my appreciation of the great care manifested in the examination of the various exhibits from day to day by the Juror of Pomology, Prof. H. E. Van Deman, whose awards were made only after the most painstaking consideration.

I am also greatly indebted to my assistants, Messrs. J. J. Collins and Robert Thompson, and to Miss K. House, for their constant and faithful attention to the duties and responsibilities devolving upon them.

It is to be regretted that the unfortunate financial position of the Exposition Company at the close has prevented them from keeping faith with the exhibitors, with regard to supplying the medals awarded. It is hoped that some other means may be devised whereby they may be furnished to those who have won them.

I remain your obedient servant,

WM. H. BUNTING,

St. Catharines, January 1st, 1902. Superintendent.

OFFICIAL LIST OF AWARDS IN HORTICULTURE.

Gold Medals.

Department of Agriculture, Province of Ontario	Display of native wines.
" "	Collection of strawberries.
" "	Display of grapes, house-grown.
" "	General display of grapes.
" "	Display of plums.
" "	Continuous display of peaches.
" "	Display of pears.
" "	Display of apples, crop of 1901.
" "	Display of apples, crop of 1900. June 7.
" "	Display of commercial apples, 1900, Aug. 17. In export cases, 97% sound.
" "	Display of apples, crop 1900, Oct. 12. Cold storage.
" "	General display of fruits.
Brennan & Son, J. F., Grimsby	Display of peaches.
Dempsey, W. H., Trenton	General display of apples.
Orr & Son, W. M., Fruitland	Continuous display of fruits.
Pay, Albert, St. Catharines	Continuous display of fruits.
Railton, A., Fonthill	Continuous display of fruits.
Titterington, James, St. Catharines	Continuous display of fruits.
Stewart, F. G., Homer	Display of fruits.
Woolverton, L., Grimsby	Display of fruits.
Spramotor Co., London	General display of spraying and whitewashing pumps and machinery.

Silver Medals.

Department of Agriculture	Installation of exhibit.
" "	Display of canned fruits and vegetables.
Ontario Agricultural College, Guelph	" bottled fruits.
Shuttleworth & Harris, Brantford	" pickles and relishes.
Armstrong, Wm., Queenston	" fruits.
Beattie, Thomas, St. Catharines	Collection of fruits.
Bunting, Gordon, St. Catharines	" "
Boyt, George, St. Catharines	Display of asparagus.
Burlington Horticultural Society	Continuous display of fruits.
Collinson, S. & W. H., St. Davids	Display of fruits.
Central Experimental Farm, Ottawa	" apples.
Dempsey, Harry, Rednersville	" "
Freel Bros., Niagara	" fruits.
Graham, R. J., Belleville	" apples.
Griffis, Alfred, St. Catharines	" fruits.
Huggard, R. L., Whitby	" "
Merritt, T. R., St. Catharines	" "
Ontario Experimental Fruit Stations	" "
Pay, Albert, St. Catharines	" asparagus.
Peck, Francis, Albury	" apples.
Peer, George N., Burlington	" fruits.
Pettit, M., Winona	" "
Purdy, C. F., St. Catharines	" Purdy peach.
Read, M A., Port Dalhousie	" seedling grape, "Lincoln."
Read, M. A., Port Dalhousie	" fruits.
Rickard, Wm., Newcastle	" apples.
Secord, C. E., St. Catharines	" fruits.
Shephard & Son, J., Queenston	" "
Smith, A. M., St. Catharines	Continuous display of fruits.
Stephens, C. L., Orillia	Display of fruits.
Tweddle, Joseph, Fruitland	" "
Thompson & Son, Robert, St. Catharines	Continuous display of fruits.

Wilder Silver Medals.

Ontario Experimental Stations..................Display of fruits.
Pettit, Murray, Winona........................ " grapes.
Pay, Albert, St. Catharines .... " fruits.

Bronze Medals.

Adams, E. P., Queenston ....Collection of fruits.
Bradley, H. C., Queenston .... " "
Bartlett, John, Oshawa ....Display of apples.
Cockburn, J. P., Gravenhurst .... " "
Cameron, R., Niagara Falls South .... " dahlias,
Currie, R., Niagara.......................... " fruits.
Culp, S. M., Beamsville........................ " "
Chaplin, W. H., Newcastle .... " apples.
Dunn, Joseph, St. Davids .... " fruits and nuts.
Fallis, Robert, Harriston .... " apples.
Fisher & Son, C. E., Queenston .... " fruits.
Graham, R. J., Belleville ....Evaporated fruits and vegetables in glass.
Horning, George, Waterdown ....Display of apples and pears.
Hagaman, Thomas C., Oakville .... " Wealthy apples.
Hambley, J. E., Cedar Springs ....Collection of peaches and apples.
Hilborn, W. W., Leamington ....Display of fruits.
Hopkins, W. V., Burlington.................... " "
Honsberger, C. M., Jordan Station..... .... " "
Jackson, W. K., Niagara .... " "
Kivell, F. H., Bridgeburg...................... " grapes.
Leckie, J. A., Clarkson's .... " apples and pears.
Law, George, Niagara Falls South .... " fruits.
Lowrey, Charles, Queenston.................... " "
McGregor, James, Whitby .... " apples.
Morden, E., Niagara Falls South............... " fruits.
McLaren, J., St. Catharines.................... " Bosc pears.
Morris, Stone & Wellington, Fonthill .... " plums.
Orser & Son, Bloomfield .... " Olivet Cherries.
Peart, A. W., Freeman ....Collection of fruits.
Patterson, James A., St. Catharines ....Display of fruits.
Randall, J. De. W., Niagara...................Display of figs.
Sexton, John. St. Catharines ....Display of gooseberries.
Scott, John, St. Catharines .... " fruits.
VanDuzer & Griffith, Grimsby................... " "
Shephard, R, W., Como, Que .... " Fameuse apples.
Stevenson, Rev. E. B., Jordan Station ....Strawberries in solution.
Ontario Grape Growing and Wine Mfg. Co., St. Catharines............................. Display of native wines.
Hamilton & Co., J. S., Brantford .... " "
Girardot Wine Co., E., Sandwich .... " "
Peart, Edwin, Burlington .... " fruits.
Department of Agriculture, Toronto............. " bottled currants.
Woolverton, L., Grimsby .... " " fruits.
Ontario Fruit Growers' Asssociation ....Literature.
Department of Agriculture ....Fruits in solution.

Wilder Bronze Medal.

Orr & Son, W. M., Fruitland ....Collection of fruits.

Honorable Mention.

Allen, W. J., Homer ....Display of raspberries and currants.
Armbrust, Wm. H., Pelham.....................Collection of fruits and nuts.
Arnold. E., & Son, Queenston.................. " fruits.
Anderson, Dr. H. L., Niagara ....Display of apples and pears.
Ashbaugh, C. D., Mohawk .... " peaches.
Andrews, Rev. Wm., Beamsville................ " seedling apples.
Adams, E. E., Leamington ....Collection of fruits.

Honorable Mention.—*Continued.*

Brown Bros., Fruitland	Display of	grapes.
Brown, H. J., & Son, Niagara	"	pears.
Bruner, John, Ruthven	"	peaches.
Bruner, Thomas, Kingsville	Collection of	fruits.
Bell, John, Audley	Display of	apples.
Backus, M., Chatham	"	Elberta peaches.
Black, Geo., St. David's	Collection of	pears.
Bennett, G. H., Walkerville	"	plums.
Biggar, G. C., Niagara Falls, South	"	fruits.
Bromley, J. E., St. Catharines	Display of	William's strawberries.
Bufton, C., Niagara	"	pears and grapes.
Clement, John, Brantford	"	quinces.
Campbell, Chas., Queenston	"	grapes.
Coatsworth, G. M., Kingsville	"	fruits.
Collins, H. E., St. Catharines	"	"
Cameron. R., Niagara Falls, South	"	lemons.
Carty, James, St. Catharines	"	peaches.
Craize, Jas., Niagara	"	Elberta peaches.
Dunn, L., St. Catharines	"	fruits.
Ellis Bros., Stamford	"	"
Ellis, Wm., St. David's	"	"
Freeman, T. M., St. Catharines	Collection of	strawberries.
Freeman, J. S., Freeman	Display of	fruits.
Freshwater, A., Grimsby	"	gooseberries.
Fisher, J. O., Virgil	"	fruits.
Fisher, W. F. W., Burlington	"	"
Fisher, Geo. E., Freeman	"	"
Grobb, J. C., St. Catharines	"	"
Ghent, T., Burlington	"	apples and plums.
Griffis, A., St. Catharines	"	fruits.
Havens, J., St. Catharines	"	peanuts.
Haynes, A., St. Catharines	"	grapes and pears.
Haynes, L., St. Catharines	"	fruits
Hague, Jas., St. Catharines	"	"
Hendershott, W. M., St. Davids	"	peaches and plums.
Hunsberry, W. A., Jordan	"	berries.
Hurd, H. H., Burlington	"	pears and crab apples.
Hunter, Chas., Niagara	"	fruits.
Hiscott, Major Jas., Virgil	"	"
Jones, Harold, Maitland	"	apples.
Johnson, Geo.. St. David's	"	blackberries and plums.
Kane, W. J., Niagara	"	grapes.
Lampman, Joseph. St. Catharines	"	"
Lawlor, B. A., Whitby	"	pears.
McIntyre, E, J., Niagara	"	fruits.
McCalla, W. C., St. Catharines	"	peaches (St. John and Mt. Rose).
Mitchell, J. G., Clarksburg	"	plums.
Myerscough, Thos., Caledonia	"	strawberries.
Myles, Mrs. A., St. Catharines	Exhibit of	canned peaches in glass.
O'Malley, D., St. Catharines	Display of	plums.
Parnall, S. E., St. Catharines	"	apples.
Parnall, Jas., St. Catharines	"	fruits.
Painter Richard, Jordan	"	currants, raspberries and gooseberries.
Pritchard, J. J., Harriston	"	apples.
Pattison, F. G. H., Grimsby	"	apples and grapes.
Prest, Percival, Stamford	"	grapes and pears.
Pendergast, John, & Son, St. David's	"	fruits.
Pettit, A. H., Grimsby	"	"
Pettit, A. C., Southend	"	"
Pettit, C. C., Fruitland	"	"
Pettit, C., Niagara Falls	"	"
Ramsay, Allan, Niagara	"	peaches.
Robertson, Geo. A., St. Catharines	"	fruits.
Robinson, Jas., Niagara	"	apples, pears and peaches.

HONORABLE MENTION.—*Concluded.*

Springer, D. W., Pt. Nelson	Display of plums and pears.
Slingerland, M., Niagara	" apples.
Symington, James, Port Dover	Collection of grapes.
Shepley, Isidore, Kingsville	Display of apples,
Sandham, James, Queenston	" peaches.
Stewart, Alex., St. Catharines	" apples.
Smith, E. D., Winona.	" fruits.
Shearer, Sam., Niagara	" "
Vrooman, W. H., Queenston	" peaches.
Wilkins, O. F., Bridgeburg	" fruits.
Woodruff, H. C., St. David's	" "
Warner, W. A., Trenton	" apples.
Watt, Dr. T. H., Niagara	" fruits.
Wyld, Mr., Hamilton	" pears.
White, C. E., St. Catharines	" cherries and currants.
Caston, Geo. C., Craighurst	" fruits in solution in glass.
Schenck, L. M., & Co., St. Catharines	" canned fruits and vegetables.
Springbank Mineral Water Co., St. Catharines	" mineral water.

STATES AND COUNTIES EXHIBITING IN HORTICULTURE.

LIST OF AWARDS OBTAINED.

	Gold Medal.	Silver.	Bronze.	Honorable Mention.	Total.
New York	44	49	103	175	371
Ontario	20	35	44	89	188
California (incomplete)	30	11	14	12	67
Oregon	18	22	51	22	113
Washington	12	16	19	7	54
Illinois	12	5	20	14	51
Michigan	9	6	25	23	63
Florida	7	5	5	..	17
Missouri	8	2	82	8	100
Wisconsin	4	4	15	11	34
Nebraska	3	2	2	2	9
Delaware	3	5	17	11	36
Connecticut	3	2	16	9	30
Idaho	3	2	10	11	26
Maine	2	1	12	3	18
Virginia	2	3	21	11	37
New Mexico	2	2	3	5	12
Nova Scotia	2	1	4	5	12
Ohio	2	..	1	1	4
Minnesota	1	1	6	8	16
New Jersey	1	1	12	7	21
Mexico	1	5	2	3	11
Arizona	1	1	1	2	5
Chili	1	1	1	1	4
Pennsylvania	..	1	..	1	2
Kansas	..	1	2	1	4
Quebec	..	..	1	..	1
New Hampshire	..	..	1	1	2
North Dakota	..	..	..	3	3
Iowa	..	..	1	..	1
Indiana	..	..	1	..	1
Dictrict of Columbia	..	..	..	1	1
Jamaica	..	1	..	..	1
Peru	..	..	1	..	1
Alabama	..	..	1	1	2
Georgia	..	..	1	3	4
Louisiana	..	..	2	..	2
Porto Rica	..	..	1	..	1
Tennessee	..	..	1	..	1
North Carolina	..	..	..	2	2
South Carolina	..	..	..	1	1
Total	191	185	499	454	1,329
Ontario	1·9	1·5	1·11	1·5	1·7

COMPARATIVE STATEMENT.

	Gold.	Silver.	Bronze.	Honourable Mention.	Total.
Illinois	12	5	20	14	51
Michigan	9	6	25	23	63
Missouri	8	2	82	8	100
	29	13	127	45	214
Ontario	20	35	44	89	188
Or comparing Ontario with the following :					
Florida	7	5	5	..	17
Delaware	3	5	17	11	36
New Jersey	1	1	12	7	21
Wisconsin	4	4	15	11	34
Nebraska	3	2	2	2	9
Idaho	3	2	10	11	26
	21	19	61	42	143
Ontario	20	35	44	89	188

COLLECTIVE EXHIBITS.

FRESH FRUITS.

E. E. Adams, Leamington. Exhibits made August 10.
Apples—Yellow Transparent.
Peaches—Alexander.
Awarded Honorable Mention.

E. P. Adams, Queenston. Exhibits made August 13, 17, 20, 27, September 5, 13.
Plums—Abundance, Burbank.
Peaches—Hynes Surprise, St. John, E. Crawford, Reeves' Favorite.
Awarded Bronze Medal.

W. J. Allen, Homer. Exhibits made July 8, 11, 30.
Raspberries— Marlboro'.
Currants—Black Naples.
Awarded Honorable Mention.

Dr. H. L. Anderson, Niagara. Exhibits made September 29th.
Apples—Fameuse.
Pears—Beurre Bosc.
Awarded Honorable Mention.

Rev. Wm. Andrews, Beamsville. Exhibit made June 5th.
Apples—Andrew's Seedling.
Awarded Honorable Mention.

Wm. H. Armburst, Chantler. Exhibits made October 7, 12.
Grapes—Brighton, Niagara, Concord.
Pears—Winter Bartlett.
Nuts--Hazel.
Awarded Honorable Mention.

Wm. Armstrong, Queenston. Exhibits made August 6, 15, 27, 30, Sept. 3, 7, 11, 17, 20.
Strawberries—Haverland.
Peaches —Waterloo, E. Crawford, Honest John, Elberta, Longhurst.
Grapes—Champion, Niagara, Salem, Wilder.
Quinces—Orange.
Plums—Green Gage, Niagara.
Awarded Silver Medal.

E. Arnold & Son, Queenston. Exhibits made August 30, September 17, 20.
Peaches—St. John.
Tomatoes—Not named.
Apples-—Not named.
Grapes—Concords, Niagara, Brighton.
Awarded Honorable Mention.

C. D. Ashbaugh, Mohawk. Exhibits made September 2, October 1.
Tomatoes—Fanny Clyde.
Peaches—Crosby.
Awarded Honorable Mention.

P. Y. Babcock, Burlington. Exhibits made August 14, 16.
Blackberries—Snyder.
Plums—Abundance.

M. Backus, Chatham. Exhibit made September 18.
Peaches—Elberta.
Awarded Honorable Mention.

G. Bernard, Niagara. Exhibit made October 3.
Peaches—Globe.

Geo. C. Biggar, Niagara Falls South. Exhibits made June 20, 22, 26.
Strawberries—Bismark, Seaforth, Margaret, Marshall, Dominion, Clyde Glen Mary, Brandywine, Williams.
Awarded Honorable Mention.

Wm. Backhouse, St. Catharines. Exhibit made October 8.
Pears—Keiffer.

Alfred Ball, Niagara. Exhibit made October 15.
Apples—Russett,

Richard Ball, St. Catharines. Exhibit made August 20.
Peaches—Early Rivers.

John Bartlett, Oshawa. Exhibit made August 22.
Apples—Golden Sweet, Duchess, Early Harvest, Primate.
Awarded Bronze Medal.

Thomas Berriman, Stamford. Exhibit made September 28.
Grapes—Concord.

Thomas Beattie, St. Catharines. Exhibits made June 17, 22, 24, July 8, 23, 30, August 5, 19, 29, September 4, 19.
Strawberries—Clyde.
Roses—In Variety.
Gooseberries—White Smith, Industry.
Peaches—Sneed, Triumph, St. John, Crosbey.
Plums—Burbank.
Grapes—Niagara, Brighton.
Awarded Silver Medal.

G. H. Bennett, Walkerville. Exhibits made September 5, 7, 9.
Plums—Burbank, Hudson River, Purple Egg, Yellow Japan.
Awarded Honorable Mention.

William Bennett, St, David's. Exhibit made August 6.
Pears—Lawson.

John Bell, Audley. Exhibit made October 3.
Apples—King, Baldwin, Greening, Wagner, Rolf, Ben Davis, N. Spy, Crab.
Awarded Honorable Mention.

Geo. C. Biggar, Brantford. Exhibit made August 26.
Apples—Duchess.

Geo. Black, St. David's. Exhibits made August 20, 30.
Pears—Clapp's Favorite, Bartlett.
Awarded Honorable Mention.

Geo. I. Bolster, Orillia. Exhibit made October 11.
Apples—McIntosh Red, Pewaukee, Baldwin, Wealthy.
Pears—Seckel.

A Borrowman, St. Catharines. Exhibit made October 15.
Quinces.

H. C. Bradley, Queenston. Exhibits made August 13, 27, September 5, 20, 21.
Peaches—Triumph, St. John, Yellow Alberg, Champion, Reeve's Favorite, Elberta, Crosbey, L. Crawford, Longhurst, Old Mixon.
Plums—Niagara, Gueii, Green Gage, Red Egg.
Pears—Bartlett, Clapp's Favorite, Duchess, Louise Bonne, Clairgeau.
Awarded Bronze Medal.

Moses Brady, Thorold. Exhibits made October 3.
Grapes—Niagara, Concord, Jessica.

Richard Brecken, Dundas Street, Toronto. Exhibit made October 18.
Apples—Spitzenberg, Hubbardson, Seedling.

J. F. Brennan & Son, Grimsby. Exhibits made August 7, September 11, 13, 25, 27, October 1, 4.

Peaches, Ashland Brand—Alexander, Early Crawford, Late Crawford, Elberta, Chair's Choice.
Awarded Gold Medal.

J. H. Broderick, St. Catharines Exhibit made September 16,
Peaches—Pratt, Carlisle, Elberta.
Grapes—Wyoming Red.

J. E. Bromley, St. Catharines. Exhibit made June 21.
Strawberries—Williams.
Awarded Honorable Mention.

H. J. Brown & Son, Niagara. Exhibits made September 7, October 2.
Pears—Beurre Bosc, Bartlett, Sheldon, Beurre d'Anjou, Seedling.
Peaches—Contennial.
Awarded Honorable Mention.

Brown Bros, Fruitland. Exhibit made October 23.
Grapes—Iona, Diana, Catawba, Niagara.
Awarded Honorable Mention.

Thos. Bruner, Kingsville. Exhibit made September 25.
Peaches—Duke of York, Elberta.
Awarded Honorable Mention.

John Bruner, Ruthven. Exhibit made August 16.
Peaches—Triumph.
Awarded Honorable Mention.

Neil Buchanan, St. Catharines. Exhibit made August 5.
Peaches—Sneed.

C. Bufton, Niagara. Exhibit made September 27.
Pears—Sheldon, Beurre Bosc.
Grapes—Rogers 19, Concord.
Awarded Honorable Mention.

C. T. Bunting, St Catharines. Exhibit made August 13.
Apples—Red Astrakhan.

Gordon Bunting, St. Catharines. Exhibits made June 20, 24, July 16, 23, 30, August 5, 13, 27, September 2, 9, 18, October 12.
Strawberries—Johnson's Early, Clyde, Crescent, Seaford, Glen Mary, Excelsior, New York, Duff, Gladstone, Greenville, Rio, Williams, Darling, Wm. Belt, Not Named.
Raspberries—Gregg, Marlboro, Turner.
Currants—Lee's Prolific.
Plums—Ogon, Burbank, Bradshaw.
Peaches—Alexander, Early Canada, St. John, Early Crawford, Reeves' Favorite.
Apples—Astrakhan
Grapes—Niagara, Concord.
Awarded Silver Medal.

Burlington Horticultural Society. Collective exhibits made July 26, August 9, 14, 16, 20, 21, 23, 28, 30, September 6, 11, 21, 25, 28, by the following individuals, details of whose exhibits may be found under their respective names.

P. Y. Babcock, J. S. Freeman, David Jardine, R, Collen, T. E. Ghent, David Kerns, Mrs. T. Dalton, Thos. Graham, J. Lindley, C. N. Dynes, Arthur Grey, Mrs. McCulloch, Herbert Dynes, W. V. Hopkins, Vernon R. Peer, Stanley Dynes, H. H. Hurd, A. W. Peart, Geo. E. Fisher, Chas. Ireland, Geo. N. Peer, E. Peart, David Fillman, Geo. Ireland, Thomas Peart, W. F. W. Fisher, John Ireland, Thomas Foster, Jonathan Ireland, W. E. A. Peer, Andrew Pettit. Thomas Ireland, C. C. Pettit, Hugo Pettit, Thomas Dalton, David Sinclair; James Sinclair, D. W. Springer, O. T. Springer, E. Thorpe.
Awarded Silver Medal.

J. H. Burns, Niagara. Exhibits made September 26, 27.
Peaches—Late Crawford.
Quinces—Cut Flowers—Fancy Coxcomb.

John Burrows, Burtch. Exhibit made August 26.
Pears—Clapp's Favorite.

R. Cameron, Niagara Falls. Exhibits made September 3, 10, 12, 25, 30, October 8, 12, 16, 25.
Assorted Cut Flowers, and Decorative Plants and out-door grown Lemons.
Awarded Bronze Medal.
Awarded Honorable Mention.

Charles Campbell, Queenston. Exhibits made September 20, 24.
Grapes—Rogers No. 22, Concord, Niagara, Worden.
Awarded Honorable Mention.

W. J. Campbell, Niagara. Exhibit made October 4th.
Pears—Beurre Bosc.
Peaches—Smock.

Jas. Carty, St. Catharines. Exhibits made Sept. 12, 18, October 3.
Peaches—Early Crawford, Late Crawford, Globe.
Awarded Honorable Mention.

J. E. Chute, Lakeview. Exhibit made May 22.
Apples—Rox Russetts.

Dominion Central Experimental Farm, Ottawa. Exhibit made October 11.
Apples—Wealthy, Wolf River, Shiawassa Beauty, Repka, Malenka, Melinda, Fameuse, Antonovka, Patten's Greening, Haas, Salome, Lawver, Edgehill, La Victoire, American Golden Russett, North Star, Missouri Pippin, Princess Louise, Gideon, MacMahon's White, McIntosh Red, Scott's Winter, Duke of Connaught, Cross, Milwaukee.
Awarded Silver Medal.

W. H. Chaplin, Newcastle. Exhibits made October 8, 18.
Apples—Gano, Baldwin, Mammoth Black Twig, Canada Red, N. Spy, Golden Russett, Ben Davis, Spitzenberg.
Awarded Bronze Medal.

A. D. Chisholm, Oakville. Exhibit made September 14.
Apples—Wealthy.

John C. Clement, Brantford. Exhibit made October 4.
Quinces—Pear.
Awarded Honorable Mention.

G. M. Coatsworth, Kingsville. Exhibits made August 21, 22.
Apples—Golden Sweet, Primate.
Plums - Abundance.
Peaches—Early Rivers.
Awarded Honorable Mention.

J. P. Cockburn, Gravenhurst. Exhibits made August 30, September 16.
Apples—Russel, Alexander, Unnamed.
Awarded Bronze Medal.

David Cole, Southend. Exhibit made September 5.
Peaches—Mountain Rose, Fitzgerald.

Evelyn Collins, St. Catharines. Exhibit made July 8.
Bouquets—Sweet Peas.

H. E. Collins, St. Catharines. Exhibits made August 5, 29, September 10, 23.
Apples—Astrakhan.
Pears—Clapp's Favorite, Beurre Clairgeau.
Plums—Ogon.
Grapes—Brighton, Empire State, Concord.
Awarded Honorable Mention.

S. & W. H. Collinson, St. Davids. Exhibits made August 6, 9, 13, 17, 27, September 5, 10, 13, 20, 26, Oct. 2.
Pears– Lawson.
Peaches—Alexander, Early Rivers, Hynes' Surprise, Mountain Rose, Fitzgerald, Garfield, Reeve's Favorite, Elberta, Wager, Early Crawford, Coolridge's Favorite, Belle of Georgia, Old Mixon, Globe, Late Crawford, Crosbey, Longhurst, Steven's Rareripe, Smock, Chair's Choice.
Awarded Silver Medal.

John Cooper, Niagara. Exhibit made October 2.
Pears—Sheldon, Keefer, Mt. Vernon.

Chas. Corley, Port Dalhousie. Exhibit made July 16.
Cherries—Seedling.

R. Cotter, Port Nelson. Exhibit made August 16.
Apples—Maiden's Blush, Duchess.

D. Cotton, Orillia. Exhibit made October 11.
Apples—Quebec Winter Sweet.

James Craise, Niagara. Exhibit made September 27.
Peaches—Elberta.
Awarded Honorable Mention.

W. T. Crouch, Virgil. Exhibit made June 5.
Apples—Golden Russetts.

S. M. Culp, Beamsville. Exhibits made June 20, July 11, August 31, October 9.
Strawberries—Clyde.
Currants—Fay's Prolific.
Gooseberries—White Smith.
Pears—Bartlett, Clapps Favorite, Duchess.
Plums—Coe's Golden Drop, Washington.
Awarded Bronze Medal.

R. Currie, Niagara. Exhibits made September 17, 21, 27, October 10, 17.
Peaches—Hill's Chili, Crosbey, Elberta, Jacques' Rareripe, Longhurst, Honest John, Old Mixon, Smock.
Pears—Duchess, Lawrence, Seckel, Langelier, Pound, Keiffer, Vicar of Wakefield, D'Anjou, Bosc.
Grapes—Niagara, Vergennes.
Apples—Golden Russett.
Nuts—Almond.
Awarded Bronze Medal.

Mrs. T. Dalton, Freeman. Exhibits made August 28, September 21.
Apples—Transcendent Crab.
Peaches—Early Rivers.
Plums—Ireland's Seedling.
Pears—Clairgeau.

Harry Dempsey, Rednersville. Exhibits made October 9, 21.
Apples—Arctic, Baldwin, Ben Davis, Bottle Greening, Black Detroit, Belleflower, Cranberry Pippin, Fallawater, Fameuse, Flushing Spitz, Grime's Golden, Gano, Golden Russett, King, McMahon's White, McIntosh Red, Missouri Pippin, North Star, R. I. Greening, Rox Russett, Stark, Swayze Pomme Gris, Scarlet Pippin, St. Lawrence, Tolman Sweet, Wealthy, Wolfe River.
Awarded Silver Medal.

R. H. Dewar, Fruitland. Exhibits made October 5, 9.
Peaches—Late Crawford.
Grapes—Brighton.

Stanley Dynes, Freeman. Exhibit made September 11.
Plums—Yellow Egg.
Pears—Goodale, Bartlett.
Grapes—Moore's Early.

W. H. Dempsey, Trenton. Exhibits made August 14, 29, September 13, 30, October 12.
Apples—Alexander, Acker, Astrakhan, Antonovka, Arabka, Becker's Red, Bush Sweet, Blunt, Bismark, Barcelona, Pearmain, Baxter, Baldwin, Bailey Sweet, Beauty of Kent, Coe's River Beauty, Cooper's Market, Duchess, Early Harvest, Eicke, Fameuse, Fanny, Fallawater, Gravenstein, Golden Gem, Gibson, Gravel Pippin, Grand Sultan, Golden Sweet, Golden Russett, Holland, Hawthornden, Hamilton, Horn, Isham, Isabella, Ingram, Kentish Fill-basket, Mann, Mann Pippin, Magog Red Streak, McLean, Munson's Sweet, Mountain Best, Maggie's Favourite, Milding, Northern Spy, Norcaster Spy, Northfield Beauty, Ontario, Old Pearmain, Primate, Palouse, Pioneer, Parlin, Plumb's Cider, Rox. Russett, Rochelle, St. Lawrence, Saxon, Starr, Spitzenburg, Switzer, Sops of Wine, Seek-no-farther, Scott's Winter, Scarlet Pippin, Trenton, Twenty Ounce Pippin, Van Morriss' Reinette, Wealthy, Washington, Strawberry, Wagner, Windsor Chief, Wharton, Winter Banana, Yellow Transparent.
Awarded Gold Medal.

Joseph Dunn, St. David's. Exhibit made September 3, 24, 28, October 8, 11, 13, 22.
Apples—Cranberry, Gloria Mundi, Fall Pippin, Baldwin, Northern Spy, Fameuse, Swazye Pomme Gris, Greening, Spitzenburg, Swaar.
Blackberries—Lawton.
Nuts—Chestnuts, Butternuts, Walnuts, Hickorynuts.
Peppers—Ruby King.
Peaches—Fitzgerald, Mountain Rose, Elberta, Longhurst, Late Crawford, McLide, Globe, Crosbey, Smock, Seedling.
Pears—Duchess, Beaurre Clairgeau.
Plums—Yellow Egg, Yellow Japan, Lombard.
Grapes—Delaware, Niagara.
Boquets—Dahlias.
Tomatoes—Ponderosa, New Stone.
Awarded Bronze Medal.

A. E. Dudinhoffer, Orillia, Exhibits made October 11.
Apples—Fameuse.

Luther Dunn, St. Catharines. Exhibits made June 18, October 16.
Strawberry plants—24 varieties.
Tropical Fruits—Cerriman or Monstera Deliciosa.
Awarded Honorable Mention.

C. N. Dynes, Freeman. Exhibits made August 14, 28, September 11, 25, 28.
Apples—Yellow Transparent.
Gooseberries—Industry.
Plums—Saunders, Burbank, Reine Claude.
Pears—Boussock.
Peaches—Alexander, Crosbey.
Grapes—Moore's Early, Wyoming Red, Niagara, Concord, Lindley, Agawam, Moyer.

Herbert Dynes, Burlington. Exhibits made September 11, October 14.
Apples—Wealthy.
Plums—Niagara, Lombard, Monarch.
Peaches—Mountain Rose, Tyhurst, Early Crawford.
Pears—Bartletts, Goodale.
Grapes—Wilder, Niagara, Lindley, Concord, Moyer.

Miss M. Douglas, St. Catharines. Display of Sweet Peas and Cut Flowers.

Ellis Bros., Stamford. Exhibit made September 10.
Peaches—Early Crawford, Reeve's Favourite.
Plums—Kingston, Pond's Seedling.
Awarded Honorable Mention.

G. E. Emmett, Sparta. Exhibit made May 22.
Apples—Golden Russetts.

Will Ellis, St. Davids. Exhibits made October 11, 15.
Pears—Keiffer, Bosc, Vicar of Wakefield, Idaho.
Peaches—Smock, Solway.
Grapes—Niagara, Lindley.
Awarded Honorable Mention.

Henry Emerick, Bridgeburg. Exhibits made September 13, 16.
Peaches—Champion, Elberta.

Robert Fallis, Harriston. Exhibit made September 30.
Apples—N. Spy, Fallawater, Greening, King, Golden Russett, Belleflower, Fameuse.
Awarded Bronze Medal.

T. H. Farmer, Port Dalhousie. Exhibit made October 7.
Display of Dahlias.
Awarded Honorable Mention.

J. J. Fee, St. Catharines. Exhibit made July 30.
Blackberries—Lawton.

James Furminger, St. Catharines. Exhibits made August 2, 6.
Currants—Fay's Prolific.
Apples—Astrakhan.

J. O. Fisher, Virgil. Exhibits made October 3.
Peaches—Late Crawford, Crosbey, Late White.
Grapes—Delaware, Cottage, Wyoming Red, Roger 19, Esther, Black Delaware.
Pears—Seed ing, Goodale, Sheldon, Keiffer.
Quinces—Orange.
Apples—Northern Spy, Pomme Gris, Greening, Fameuse, Sweet, Mann, Rox. Russett, King, Baldwin.
Awarded Honorable Mention.

W. F. W. Fisher, Burlington. Exhibits made August 9, 14, 16, 23, 30, September 6, 11, 21, 28.
Apples—Primate, Duchess, Wealthy, Ribston Pippin, Wagner.
Pears—Clapp's Favorite, Bartlett, Boussock, Duchess, Goodale, Lawton, Sheldon.
Plums—Niagara, Abundance, Burbank, Pond's Seedling, Glass Seeding, Yellow Egg, Duane's Purple, Lombard.
Peaches—Alexander, E. Rivers.
Mulberries—White Russian, Pink Russian.
Grapes—Moore's Early, Niagara, Brighton, Delaware.
Nuts—Walnuts.
Awarded Honorable Mention.

S. D. Furminger, St. Catharines. Exhibit made June 20, August 16.
Apples—Astrakhan.
Strawberries—Glen Mary.

David Fillmar, Burlington. Exhibits made August 16, 21.
Plums—Abundance, Ireland's Seedling.
Peaches—Early Rivers.

C. E. Fisher & Son, Queenston. Exhibits made August 23, 27, 28, 30, September 3, 7, 10, 17, 20.
Plums—Niagara, Burbank, Shipper's Pride, Washington.
Peaches—E. Rivers, St. John, E. Crawford, Honest John, Jacques' Rareripe, Coolridges Favorite, Late Crawford, Elberta, Crosby.
Awarded Bronze Medal

George E. Fisher, Freeman. Exhibit made August 14, 23, 28, 30, September 6, October 3.
Currants—Black Champion, Lee's Prolific.
Apples—Duchess.
Plums—Ireland's Seedling, Burbank, Abundance, Bradshaw, Niagara, Washington, Yellow Egg, Gueii.
Pears—Bartlett, Boussock, Duchess, Keiffer.
Awarded Honorable Mention.

J. C. Flower, St. Catharines. Exhibits made August 20, September 4.
Plums—Burbank.
Peaches—Early Crawford.

Thos. Foster, Burlington. Exhibits made August 21, 30, September 21, 25.
Plums—Ireland's Seedling, Niagara.
Pears—Boussock, Duchess.
Peaches—Early Rivers.
Apples—Northern Spy.

Francis, The Florist, Oshawa. Exhibit made August 29.
Cut Flowers, Dahlias, Gladiolus.

W. S. Fraser, Bradford. Exhibit made October 4.
Apples—Seedling, Red Flesh.

Freel Bros., Niagara. Exhibits made September 4, 11, 13, 20, 27, October 12.
Peaches—St. John, E. Crawford, Foster, Alberg, Great Northern, Crosby, Old Mixon, Longhurst, Barnard, Elberta, Lord Palmerston, Globe, M'Lide Chidling, Reeve's Favorite, L. Crawford, Fitzgerald, Chair's Choice, Solway, Centennial, Wonderful.
Pears—Louise Bonne de Jersey.
Apples—Fameuse, Rox. Russett.
Awarded Silver Medal.

J. S. Freeman, Freeman. Exhibits made August 16, 21, 20, September 11, October 3.
Pears—Giffard, Boussock, Duchess, Bartlett.
Plums—Niagara, Burbank.
Apples—Yellow Transparent, Trancendent Crab.
Awarded Honorable Mention.

Amos Freshwater, Grimsby. Exhibit made August 8.
Gooseberries—White Smith, Crown Bob.
Awarded Honorable Mention.

M. Field, Virgil. Exhibit made October 3.
Peaches—Chairs' Choice.

T. M. Freeman, St. Catharines. Exhibit made June 18.
Strawberries—Marshall, Clyde, New York, Nick Omer, Glen Mary, Ruby, Splendid, Sample.
Awarded Honorable Mention.

John Gallagher, St. Catharines. Exhibit made August 12.
Peaches—Early Rivers.

T. Ghent, Burlington. Exhibits made August 9, 30.
Plums—Niagara, Lombard.
Peaches—Early Rivers.
Apples—Sweet Bough.
Awarded Honorable Mention.

W. H. Gibson, Newcastle. Exhibit made October 8.
Apples—Ontario, Spy, Ben Davis.

F. A. Goring, Homer. Exhibit made August 26.
Grapes—Moyer, Champion, Jessica.

Thomas Graham, Burlington. Exhibit made August 14.
Gooseberries—Industry.

R. J. Graham, Belleville. Exhibits made September 18, 23, 24, 28, October 4, 9, 17.
Apples—Autumn Strawberry, Fameuse, Haas, Maiden's Blush, Colvert, Not Named, Boiken, St. Lawrence, Golden Russet, Lowell, Fall Orange, Wealthy, Hawley, 20 Ounce, Ribston, Blenheim, Ben Davis, Strawberry, Stark, Tolman Sweet, Pennock, Seek-no-Farther, Mann, Baldwin, McIntosh Red.
Awarded Silver Medal.

Arthur Grey, Pt. Nelson. Exhibit made August 14.
Gooseberries—Industry.

Alfred Griffis, St. Catharines. Exhibits made June 17, 18, 21, 24, August 6, 9, 16, 26, September 20, 30, October 2, 18.
Strawberries—Williams, Michel, Clyde, New York, Williams.
Peaches—Alexander, E. Rivers, Elberta, Late Crawford, Steven's Rareripe.
Plums—Ogon, Burbank, Abundance.
Grapes—Concord, Niagara, Salem, Delaware, Creveling, Brighton, Diamond, Rogers 9.
Pears—Keiffer.
Awarded Silver Medal.
Awarded Honorable Mention.

J. C. Grobb, St. Catharines. Exhibits made July 24, 25, August 30, September 5, 14.
Apricot—Russian.
Plums—Orange, Green Gage, Yellow Gage, Pond's Seedling.
Peaches—Early Crawford.
Awarded Honorable Mention.

T. C. Hagaman, Oakville. Exhibits made July 6, September 14.
Strawberries—Not named.
Apples—Wealthy.
Awarded Bronze Medal.

James Hague, St. Catharines. Exhibits made August 19, September 2, 20.
Peaches—Early Rivers, Triumph, Early Michigan, Early Crawford, Late Crawford, Old Mixon, Not Named.
Plums—Paragon, Shiro.
Pears—Brockworth Park.
Awarded Honorable Mention.

J. E. Hambley, Cedar Springs. Exhibits made August 8, 16, 21, September 6, 13, 25, 28, October 16, 23.
Peaches—Alexander, Amsden's June, Waterloo, Zulu, Triumph, Early Rivers, Early Crawford, Barnard, Champion, Elberta, Hill's Chili.
Apples—Mann, Wagener, Hubbardston, Ben Davis, Pearmain, Tompkin's King, Twenty Ounce, Stark, Belleflower, Quince.
Awarded Bronze Medal.

Joseph Hanniwell, St. Davids. Exhibit made October 8.
Peaches—Smock.

Andrew Haynes, St. Catharines. Exhibits made September 2, 14, 23.
Grapes—Niagara, Moore's Early, Rogers 22, Worden, Wyoming Red, Agawam, Delaware, Lindley.
Pears—Clapp's Favorite.
Awarded Honorable Mention.

Lewis Haynes, St Catharines. Exhibits made September 14, 30.
Grapes—Delaware, Concord, Brighton.
Peaches—Late Crawford, Chair's Choice.
Awarded Honorable Mention.

C. S. Harvie, Orillia. Exhibits made October 11th.
Apples—Wolf River, McIntosh Red, Alexander.

J. Havens, St. Catharines. Exhibit made October 10th.
Peanuts.
Awarded Honorable Mention.

W. M. Hendershot, St. Davids. Exhibits made August 17, September 3, 17, October 8.
Plums—Abundance, Gueii.
Peaches—Hynes, Surprise, Early Rivers, Reeve's Favourite, Champion, Mountain Rose, Early Crawford, White Seedling.
Awarded Honorable Mention.

W. W. Hilborn, Leamington. Exhibits made July 17, August 10, 16, 29, September 18, 25.
Cherries—Windsor, Montmorency.

Currants—Cherry.
Raspberries—Cuthbert.
Plums—Willard, Red June, Ford's Early, Abundance, Chabot, Satsuma, Berkmans, Wickson.
Peaches—Greensboro', Red Rivers, Early Rivers, Saint John, Mrs. Brett, Tyhurst, Crosby, Jacques' Rareripe, Late Crawford, Bronson, Pearce's Yellow, Nanaper, Mary's Choice, Stevens, Elberta, Kalamazoo, Oscar's Black Prince.
Pears—Wilder.
Awarded Bronze Medal.

Thomas Hiscott, Niagara. Exhibit made September 27th.
Grapes—Niagara.
Apples—Snow.

James Hiscott, Virgil. Exhibits made September 11, 15, 27.
Pears—Bartlett, Keiffer, Sheldon.
Peaches—Globe, Late Crawford, Old Mixon, Wheatland, Elberta.
Grapes—Concord, Pocklington, Niagara.
Awarded Honorable Mention.

W. V. Hopkins, Burlington. Exhibits made August 14, 16, 21, 23, 28, September, 6. 11, 25, October 3.
Pears—Lawson, Bartlett, Goodale, Clapp's Favourite.
Apples—Duchess, Yellow Transparent, Late Bough, Fameuse.
Peaches—Alexander, Early Rivers, Mountain Rose, Barnard, Hill's Chili, Elberta, Crosby, Old Mixon.
Plums—Burbank, Washington, Lombards, Niagara, Pond's Seedling, Common Blue.
Awarded Bronze Medal.

George Horning, Waterdown. Exhibit made October 3rd.
Apples—Fameuse, Spy, Swaar, Ribston, Pippin, Mann, Seek-no-farther.
Pears—Bourre d' Anjou.
Awarded Bronze Medal.

Mrs. Houston, St. Catharines. Exhibits made August 19, 20.
Apples—Astrakhan, Duchess.

W. House, Bridgeburg. Exhibit made September 25th.
Peaches—Old Mixon, Waterloo, Elberta.

R. L. Huggard, Whitby. Exhibits made August 22, 29, October 3, 16, 21.
Apples—Duchess, Transparent, Astrakhan, Early Harvest, Kentish Fillbasket, Pippin, Salome, Ben Davis, Baldwin, Greening, Wealthy, Swaar, Pennock, Fameuse, Golden Russett, Twenty Ounce, Western Beauty, Spy, Boston Star, Ribston, Tompkin's King, Minkler, Canada Red, not named.
Pears—Clapp's Favourite, Rostiezer, Belle Lucrative, Sheldon, Mount Vernon, Goodale, Idaho, Giant Morceau, Buerre d' Anjou, Le Conte, Keiffer, Souvenir, Winter Nelis, Lawrence, Buffum, Gen. Druard, Japan Golden Russett, Clairgeau, Abbe de Paris, Duchess.
Plums—Magnum Bonum, Burbank, Diamond, Imperial Blue, Abundance, Washington, Prince of Wales, Gen. Hand, Montreal Beauty, Gueii.
Awarded Silver Medal.

W. A. Hunsberry, Jordan. Exhibit made July 16.
Raspberries—Marlboro'.
Currants—Fay.
Awarded Honorable Mention.

C. M. Honsberger, Jordan Station. Exhibits made June 18, July 16, August 28.
Strawberries—Clyde, Glen Mary, Michel.
Currants—Fay.
Peaches—St. John.
Grapes—Moore's Early, Moyer.
Awarded Bronze Medal.

Chas. Hunter, Niagara. Exhibits made September 12, 13.
Plums—Shippers' Pride, Green Gage, Imperial Gage.
Peaches—Early Crawford, Reeve's Favorite.
Pears—Bartlett.
Grapes—Merrimack, Niagara.
Awarded Honorable Mention.

H. H. Hurd, Burlington. Exhibits made October 2.
Pears—Clairgeau, Seckel, Keiffer.
Apples—Crab.
Awarded Honorable Mention.

Miss M. Hutt, Stamford. Exhibit made July 29th.
Gooseberries—Industry, Pearl, Houghton, White Smith, Downing.

A. G. Hull & Son, St. Catharines. Display of cut flowers.

Charles Ireland, Port Nelson. Exhibit made August 30.
Plums—Common Blue, Ireland's Seedling.

George Ireland, Port Nelson. Exhibit made August 30.
Plums—Ireland's Seedling.
Pears—Tyson.

John Ireland, Port Nelson. Exhibits made August 9, 14, 21, 30, September 11, 21, 25, 28 October 3.
Plums—Washington, Gueii, Lombard, Ireland's Seedling, Normands, Sugar, Staunton.
Gooseberries—Industry.
Apricots—
Peaches—Alexander.
Apples—Ribston Pippin, Duchess.
Pears—Clapp's Favorite, Duchess.
Grapes—Lindley, Niagara, Concord.
Quinces—

Jonathan Ireland, Port Nelson. Exhibit made October 14th.
Pears—Keiffer, Clairgeau, Beurre d' Anjou, White, Doyenne.
Apples—Fameuse, Blenheim, Pippin, Golden Russet.

Thomas Ireland, Port Nelson. Exhibits made August 16, October 14.
Plums—Ireland's Seedling, Imperial Gage, Yellow Gage, Swiss.
Apples—Greening, Baldwin, Golden Russet.
Pears—Beurre de Anjou.

W. K. Jackson, Niagara—Exhibits made September 12, 21, 27, October 4, 8.
Peaches—Hans Golden.
Pears—Flemish Beauty, Bartlett, Louise Bonne, Beurre d' Anjou, Duchess, Beurre Bosc.
Apples—Bottle Greening, Golden Russet, Crab, Northern Spy, Swayzie's Pomme Gris, Phœnix, R. I. Greenings.
Grapes—Prentiss, Vergennes, Catawba.
Walnuts—English.
Awarded Bronze Medal.

D. Jardine, Port Nelson. Exhibits made August 21, 28, September 25, 28.
Plums—Marianna, Burbank, Prunus Simonii, Shipper's Pride, Yellow Egg, Niagara, Gueii, General Hand.
Grapes—Concord, Niagara.
Apples—Transcendent Crab.

Harold Jones, Maitland. Exhibit made October 4th.
Apples—Scarlet, Pippin, Fameuse.
Awarded Honorable Mention.

George Johnson, St. David's. Exhibit made Aug. 9.
Plums—Abundance.
Blackberries—Lawton.

Mrs. Helen Joy, Orillia. Exhibit made October 11.
Apples—Red Russet.

Ralph Kalar, Niagara Falls South. Exhibit made October 3.
Grapes—Concord.

W. J. Kane, Niagara. Exhibit made September 21.
Grapes—Niagara.
Awarded Honorable Mention.

David Kerns, Freeeman. Exhibit made September 25, 28.
Apples—Transcendent Crab, Northern Spy.
Grapes—Agawam.
Pears—Clairgeau.

E. Kennedy, Jordan. Exhibit made July 16.
Raspberries—Marlboro'.

Wesley Kerns, Freeman. Exhibits made September 25, 28.
Grapes—Niagara, Agawam.
Apples—Transcendent Crab, Golden Russett, Northern Spy.

F. H. Kivell, Bridgeburg. Exhibit made September 10.
Grapes—Duchess, Delaware, Niagara.
Awarded Bronze Medal.

Mrs. H. Kottmier, St. Catharines. Exhibit made July 8.
Flowers—Sweet Peas.

Joseph Lampman, St. Catharines. Exhibits made September 11, October 21.
Grapes—Delaware, Roger 4, Roger 22, Niagara, Moore's Diamond.
Awarded Honorable Mention.

J. D. Larkin, Queenston. Exhibit made September 24.
Peaches—Globe.

R. A. Lehmann, Orillia. Exhibit made October 11.
Apples—Fallawater.
Pears—Flemish Beauty.

B. A. Lawlor, Whitby. Exhibit made October 3.
Pears—Louise Bonne de Jersey.
Awarded Honorable Mention.

Alex. Lawson, St. Davids. Exhibit made August 22.
Grapes—Moore's Early.

George Law, Niagara Falls South. Exhibits made June 20, 22, 26, July 6, 20, August 29, October 3, 11.
Strawberries—Marshall, Clyde, Excelsior, Brandywine, Williams.
Gooseberries—Golden Prolific, Industry, Smith's Improved, Downing.
Raspberries—Marlboro, Gregg, Golden Queen.
Currants—Fay's Prolific, Moore's Ruby, Raby Castle, White Grape.
Plums—Washington, Niagara.
Pears—Clairgeau, Keiffer, D'Anjou.
Awarded Bronze Medal.

J. A. Leckie, Clarkson. Exhibit made October 17.
Apples—Stark, Northern Spy, Ribston, Fallawater, Rox. Russet, Tolman Sweet, Phoenix, Swazie, Belleflower, Spitzenburg, Fameuse, Baldwin, Melinda, Fall Pippin, Golden Russet, Belle Russet, Mann, Greening.
Pears—Sheldon, Beurre d' Anjou, Keiffer.
Awarded Bronze Medal.

A. A. Leslie, Aylmer. Exhibits made June 22, September 2, 24.
Strawberries—Clyde, Woolverton.
Plums—Washington.
Apples—Baldwin, Wagner, N. Spy, Pound, Gideon, Wealthy.

J. Lindley, Freeman. Exhibit made August 30.
Plums—Niagara.
Peaches—Early Rivers.

S. Lobb, Virgil. Exhibit made August 27.
Peaches—Yellow St. John.

Charles Lyons, Queenston. Exhibits made September 5, 20.
Plums—Lombard, Satsuma, German Prune, Yellow Egg, Niagara.

Mrs. M. Mills, Sparta. Exhibit made May 22.
Apples—Newtown Pippin.

Charles Lowrey, Queenston. Exhibits made August 6, 20, 30, September 7, 10, 17, 26.
Plums—Ogon, Abundance, Burbank, Niagara, Lowrey's Gage, Imperial Gage, Moyer, Gueii, Quackenbos, Satsuma, Lombard, German Prune, Reine Claude.
Peaches—Triumph, St. John, Mountain Rose, Early Crawford, Reeve's Favourite, Longhurst.
Pears—Howell, Sheldon, Duchess, Seckel, Clairgeau.
Grapes—Vergennes, Delaware, Concord, Niagara.
Awarded Bronze Medal.

L. Leverton, Sparta. Exhibit made May 22.
Apples—Cooper's Market.

F. A. Medcraft, Sparta. Exhibit made May 22.
Apples—Ben Davis.

Charles McGowan, Brighton. Exhibit made June 18.
Apples—Northern Spy.

Robert Malcom, Orillia. Exhibit made October 11.
Pears—Idaho.

A. Martin, Consecon. Exhibit made October 14.
Apples—Haas.

O. E. May, Port Dalhousie. Exhibit made July 16.
Cherries—Black Heart, Governor Wood.

Joseph May, Queenston. Exhibit made August 17.
Plums—Wray's Seedling.

W. C. McCalla St. Catharines. Exhibit made September 3.
Peaches—St. John, Mountain Rose.
Awarded Honorable Mention.

Frank McHugh, St. Catharines. Exhibit made September 10.
Peaches—Early Crawford.

Mr. McCulloch, Port Nelson. Exhibit made October 2.
Apples—Fameuse, Canada Red, Mann, Golden Russet, Baldwin.

J. Macgregor, Whitby. Exhibit made October 3.
Apples—Fameuse, Pewaukee, Tolman, Stark, Ben Davis, Ribston, Golden Russet, Seek-no-farther, Baldwin, King, Kentish Fillbasket, Belleflower, Fall Pippin, R. I. Greening.
Awarded Bronze Medal.

T. McIntee, St. Catharines. Exhibit made August 5.
Pears—Early Harvest.

E. J. McIntyre, Niagara. Exhibits made September 2, 12, 19, October 2.
Peaches—Elberta, Yellow St. John, Old Mixon, Longhurst, Crosby, Smock.
Pears—Keiffer, Swan's Orange.
Grapes—Niagara.
Awarded Honorable Mention.

J. McLaren, St. Catharines. Exhibit made September 27.
Pears—Beurre Bosc.
Awarded Bronze Medal.

W. N. McLeod, Stamford. Exhibit made September 28.
Grapes—Brighton, Delaware, Niagara, Concord.

T. R. Merritt, St. Catharines. Exhibits made July 8, 30, September 11, 20, October 4.
Currants—Fay's Prolific.
Gooseberries—Whitesmith, Loudon, Industry, Crown Bob, Golden Ball, Wellington.
Grapes—Black Hamburg, Golden Chasselis, Concord, Grisley Frontenac, Brighton, Niagara, Delaware, Vergennes, Wilder.
Awarded Silver Medal.

Thos. Myerscough, Caledonia. Exhibit made June 30.
Strawberries—Williams.
Awarded Honorable Mention.

Mrs. A. W. Myles, St. Catharines. Exhibit made July 8.
Canned Peaches.
Awarded Honorable Mention.

C. S. Miller, Kingsville. Exhibit made September 20.
Peaches—Late Crawford.

H. G. Milling, Stamford. Exhibit made September 12th.
Pears—Bartlett, Flemish Beauty.
Peaches—Elberta.

J. G. Mitchell, Clarksburg. Exhibit made September 13th.
Plums—Arch Duke, Stoddart, Orient, Yellow Egg, Red Diamond, Monarch, Quackenboss, Glass Seedling, General Hand, Reine Claude, Gold, Coe's Golden Drop.
Awarded Honorable Mention.

E. Morden, Niagara Falls South. Exhibits made August 3, 13, 29, September 10, 12, 14, 18, 28, October 3, 9.
Peaches—Alexander, Early Rivers, Triumph, St. John, Champion, Elberta, Smock.
Pears—Boussock, Bartlett, Clapp's Favourite.
Grapes—Champion, Moore's Early, Niagara, Concord.
Flowers—Dahlias, Hydrangias, Eulalias.
Awarded Bronze Medal.

John Moore, St. Catharines. Exhibit made August 26th.
Pears—Clapp's Favorite.

Morris, Stone & Wellington, Fonthill. Exhibits made July 27, 24, August 10, 14, 17, 28, 31, September 4, 7, 14, 18. October 3.
Plums—Loveland, Yellow Egg, Reine des Mirabelles, American Violet, Fox, Red June, Lucy Grieve, Wickson.
Peaches—Triumph, Hortense Rivers, Lewis Seedling, Rentz Wonder, Golden Drop, Lemon Free, Fitzgerald, Champion, Seedling.
Apples—Summer Belle, Iona, Bohemian Girl.
Awarded Bronze Medal.

Cut Flowers—General and continuous exhibit of Roses, Dahlias, Begonias.
Award not made through error.

Thomas Mowers, St. Davids. Exhibit made September 20th.
Pears—Clarigeau.

Alex. Muir, Niagara. Exhibit made October 2nd.
Quinces—Orange.
Pears—Keiffer.

John Muir, St. Davids. Exhibit made September 20th.
Peaches—Crosby.

Robert Nixon, St. Catharines. Exhibit made July 10th.
Currants—Fay's Prolific.

Charles Ogg, Bartonville. Exhibit made October 8th.
Quinces.

D. O'Malley, St. Catharines. Exhibit made August 29th.
Plums—Burbank, Bradshaw.
Awarded Honorable Mention.

W. M. Orr & Son, Fruitland. Exhibits made July 6, 10, 11, 16, 20, 25, 27, August 5, 12, 17, 21, 28, 30, 31, September, 3, 5, 17, 20, 24, 30. October 2, 5, 8, 9, 14, 23.
Cherries—Windsor, Governor Wood, E. Richmond, Black Tartarian, Elkhorn, Napoleon, Biggariau, Cleveland, Schmidt's Biggariau, Yellow Spanish, Montmorency, English Morello.
Peaches—Alexander, E. Rivers, Wheatland, Smock, Steven's Rareripe, Centenial.
Pears—Giffard, Doyenne, Wilder, Clapp's Favorite, Louise Bonne, Ostrand's Summer, Sapairgauke, Bartlett, Souvenir du Congress, Duchess, General Druard, Idaho, Keiffer, Clairgeaus, D'Anjou, Sheldon, Bosc Seckel, Josephine de Malines.
Plums—Duane's Purple, Shipper's Pride, Bradshaw, Orleans Golden, Washington, Imperial Gage, Lowell's Seedling, Gueii, McLaughlin, Niagara, Red Egg, Galbraith, Smith's Orleans, Carman's Seedling, Beauty of Naples, Kingston, Green Gage, Quackenbos, General Hand, Pond's Seedling, Grand Duke, Canada Orleans, Sugar, Lombard, Belle de September, Wickson, Coe's Golden Drop, German Prune, Reine Claude, Damson, Purple Egg, Small Blue.
Grapes—Champion, Moore's Early, Niagara, Brighton, Wyoming Red, Delaware, White Mountain, Wilder, Catawba, Empire State, Agawam, Pocklington Concord, Vergennes, Salem, Isabella, Rogers No 44.
Quinces.
Apples—Astrakhan, Greening, Baldwin, Northern Spy.
Crab Apples—Gen. Grant, Whitney, Transcendent, Hyslop.
Nuts—Walnuts, Hickory.
Awarded Gold Medal
Awarded Wilder Bronze Medal.

Orser & Son, Bloomfield, Ont. Exhibit made July 15.
Cherries—Olivet.
Awarded Bronze Medal.

Henry Parker, Bayham. Exhibit made May 22.
Apples—Ben Davis.

Richard Painter, Jordan. Exhibit made July 16.
Currants—Fay, Cream Drop, White Smith.
Awarded Honorable Mention.

Edward Parnall, St. Catharines. Exhibit made August 8
Apples—Duchess.

James Parnall, St. Catharines. Exhibit made August 8.
Pears—Giffard, Lawson.
Plums—Ogon.
Awarded Honorable Mention.

Seymour Parnall, St. Catharines. Exhibit made July 16.
Cherries—Seedling.

S. S. Parnall, St. Catharines. Exhibit made July 16, August 27.
Cherries—Seedling.
Plums—Niagara, Washington, Jefferson, St. Catharines.
Awarded Honorable Mention.

Jas. A. Patterson, St. Catharines. Exhibit made June 11, 15, 22, July 9, 16, September 3.
Strawberries—Vandevere, Brandywine.
Pears—Bartlett, Clapp's Favorite.

Raspberries—Marlboro', Hilborn, Gregg.
Currants—Fay, Cherry.
Awarded Bronze Medal.

F. G. H. Pattison, Grimsby. Exhibit made August 31.
Grapes—Moore's Diamond.
Apples—Wealthy.
Awarded Honorable Mention.

A. Pay, St. Catharines. Exhibits made June 18, July 8, August 12, 26, 27, 29, September 2, 3, 4, 6, 9, 10, 20, October 2, 23.
Strawberries—Splendid, Clyde, Glen Mary, Rio, Greenville, Darling, Crescent, Excelsior, Johnson's Early, Michel.
Flowers—Yucca, Crimson, Rambler.
Pears—Giffard, Clapp's Favorite, Bartlett, Sheldon, Triumph de Vienne, Beurre Clairgeau, Beurre Superfine, Doyenne DuComice, Souvenir du Congress, Goodale, D'Anjou, Duchess, Josephine de Malines, Doyenne Boussock, Howell, Bergamot, Beurre Gris, Duchess de Angouleme, Lawrence, Mount Vernon, Belle Lucrative, Beurre Bosc, Winter Nelis, White Doyenne, Gray Doyenne, Keiffer, Louise Bonne de Jersey.
Plums—Burbank, Bradshaw, German Prunes, Moyer, Prince of Wales, Grand Duke, Yellow Seedling, Pond's Seedling, Paragon, Reine Claude.
Apples—Astrakhan.
Grapes—Moore's Early, Niagara, Worden, Roger's No. 4, Brighton, Concord.
Peaches—Champion, E. Crawford, Susquehanna.
Awarded Wilder Silver, and Gold Medal.

A. W. Peart, Burlington. Exhibits made July 26, August 14, 21, 23, 28, September 5, 11, 21, 25, 28, October 14.
Currants—Raby Castle, Red Dutch, Brayley's, Pomona, Prince Albert, Fay, Versailles, Belle de St. Giles, Wilder, North Star, Victoria, New Victoria, Red Cross, White Imperial, White Grape, Saunder's Black, Collin's Prolific.
Apples—E. Harvest, Cranberry Pippin, Greening, Baldwin, Rox. Russet, Tompkin's King, St. Lawrence, Northern Spy, Blenheim Pippin.
Pears—Clapp's Favorite, Giffard, Bartlett, Sheldon, Duchess, Belle Lucrative, D'Anjou, Keiffer.
Plums—Ogon, Botan, Marianna, Abundance, Damson, Moore's Artic, Burbank, Prince of Wales, Satsuma, Ireland's Seedling, Shropshire, Bradshaw, Gueii, Normands, Quackenbos, Hudson River Purple Egg.
Mulberries—Russian.
Peaches—Champion.
Tomatoes—Dominion Day.
Grapes—Moore's Early, Niagara, Worden, Roger No. 4, Brighton, Concord.
Awarded Bronze Medal.

E. Peart, Burlington. Exhibits made August 21, 30, September 6, 21, 28, October 14.
Plums—Niagara, Burbank, Washington, Yellow Egg, Satsuma, Hudson River, Purple Egg, Reine Claude, Ireland's Seedling Lombard, Normand, Monarch, Shipper's Pride, Gueii.
Pears—Bartlett, Sheldon, White Doyenne, Beurre, D'Anjou, Duchess.
Apples—Ribston, Duchess, Transcendent Crab, Wealthy, Mann, Baldwin, Greening, Tompkin's King.
Grapes—Lindley, Agawam, Concord.
Awarded Bronze Medal.

Thomas Peart, Freeman. Exhibit made September 28.
Grapes—Delaware Concord.

Francis Peck, Albury. Exhibits made September 16, October 11.
Apples—Black Detroit, Ribston, Lowell, Autumn Strawberry, Chenango, Strawberry, Baldwin, Ben Davis, Pumpkin Sweet, R. I. Greening, Northern Spy, Twenty Ounce, Maiden's Blush, Cranberry, Gloria-Mundi, Red Bietigheimer, Pound Sweet, Keswick Codling, Tompkin's King, Bailey Sweet, Mountain Greening, Hawley, Limber Twig, Wolf River, Fallawater, Canada Red, Cabashaw, Ontario, Magog Red Streak, Colvert, French Spitzenberg, Swaar, Hulbert, Red Detroit, Jenneting, Stark, Bottle Greening, Strawberry Pippin, Grime's Golden, Gravenstein, Sweet Greening, Seek-no-farther, Tolman Sweet, Mother, Gideon, Empress of Russia, Wagner, Hubbardstone, Fameuse, Bottle Russet, Streaked Pippin, Winter Snow, Atkin's Red Winter, Princess Louise, English Russet, Missouri Pippin, Primate, Minister, Newtown Pippin, Pewaukee, Gano, Arctic, McIntosh Red, Swayzie's Pomme Gris, Roxbury Russet, Pennock, La Rue.
Awarded Silver Medal.

John Pendergast & Son, St. David's. Exhibits made September 7, 17, October 2, 8.
Peaches—E. Crawfords, L. Crawfords, Globe, Smock.
Pears—Keiffer.
Awarded Honorable Mention.

George N. Peer, Freeman. Exhibits made August 9, 14, 16, 21, 23, 28, 30, September 6, 11, 21, 25, 28, October 5.
Pears—Lawson, Clapp's Favorite, Tyson, Bartlett, Giffard, Boussock, Goodale, Duchess, Sheldon, Louise Bonne de Jersey, Clairgeau, Beurre d'Anjou.
Apples—Primate, Duchess, Astrakhan, Sweet Bough, Wagner, Wealthy, Snow, Transcendent Crab, Greening.
Blackberries—Kittatinny, Western Triumph, Snyder.
Plums—Ireland's Seedling, Saunders, Abundance, Burbank, Washington, Moore's Arctic, Prunus, Simonii, Duane's Purple, Niagara, Gueii, Bradshaw, Victoria, Shipper's Pride, Sugar, Common Blue, German, Lombard, Hudson River Purple Egg, Monarch, Pond's Seedling, Reine Claude, Staunton.
Elderberries—
Grapes—Wyoming Red, Moore's Early, Moore's Diamond, Delaware, Worden Niagara, Lindley, Brighton, Wilder, Concord, Agawam.
Tomatoes—Dominion Day.
Awarded Silver Medal.

W. E. A. Peer, Freeman. Exhibit made August 14, 28.
Plums—Ireland's Seedling.
Pears—Tyson.

Vernon R. Peer, Freeman. Exhibit made September 28, 29.
Nuts—Butternuts.

Andrew Pettit, Freeman. Exhibit made September 25.
Grapes—Niagara, Vergennes, Concords, Wilder.

A. C. Pettit, Southend. Exhibit made October 3.
Peaches—Crosby, Millionaire.
Awarded Honorable Mention.

A. H. Pettit, Grimsby. Exhibit made September 13.
Peaches—Crawford, Barnard, Mountain Rose.
Pears—Bartlett.
Awarded Honorable Mention.

Miss Pettit, Southend. Exhibits made September 18, October 3.
Flowers—Gladiolus, Dahlias.

C. C. Pettit, Fruitland. Exhibit made October 4, 23.
Plums—German Prunes, Wickson, Coe's Golden Drop, Reine Claude, Gen. Hand.
Peaches—L. Crawford.
Pears—Beurre D'Anjou, Louise Bonne de Jersey, Bartlett, Keiffer, Sheldon.
Quinces—
Grapes—Black Rogers, Catawba, Concord.
Awarded Honorable Mention.

Hugh Pettit, Freeman. Exhibit made September 25.
Grapes—Niagara, Concord, Wilder.

M. Pettit, Winona. Exhibits made Sept. 20, October 2.
Grapes Duchess, Alice, Croton, Roger No. 4, Lindley, Black Delaware, Pocklington, Early Dawn, Salem, Agawam, Victoria, Roger No. 1, Catawba, Niagara, Isabella, Roger No. 41, Oneida, Green Golden, Olita, Roger No. 28, Roger No. 34, Noah, Triumph, Lady, Woodruff Red, Cambridge, America, Diana.
Pears—Vicar of Wakefield, D'Anjou, Keiffer, Duchess.
Awarded Silver Medal.
Awarded Wilder Silver Medal. For display 110 varieties grapes.

H. Pickett, Clarkson. Exhibit made October 17.
Apples—Northern Spy, Ribston, Roxbury Russet, Tolman Sweet, Belleflower, Spitzenberg, Fall Pippin, Mann, Greening.

Isaac Pew, Niagara Falls South. Exhibit made September 28.
Grapes—Niagara.

Robert Pollock, Bartonville. Exhibit made October 8.
Raspberries—Twigs Red Raspberries.

D. D. Potter, St. Catharines. Exhibit made August 13.
Nuts—Walnuts (English).

G. D. Prest, Queenston. Exhibit made September 30.
Grapes—Niagara.

Percival Prest, Stamford. Exhibit made September 28.
Pears—Duchess, Beurre Clairgeau.
Grapes—Vergennes, Brighton, Delaware, Niagara, Salem.
Awarded Honorable Mention.

J. J. Pritchard, Harriston. Exhibits made September 21, October 21.
Apples—Alexander, Twenty Ounce, Pippin, Colvert, Wealthy, Duchess, Hyslop Crab, Northern Spy.
Awarded Honorable Mention.

Province of Ontario, Toronto. Exhibits made May 20, June 3, 10, 24, July 1, 15, 23, 24, September 13, 20, October 11, 18, August 6, 13, 20.
Display of Gooseberries, Strawberries, Plums, Peaches, Pears, Grapes, 1901 Apples, Cold Storage Apples.
Awarded eleven Gold Medals.

C. F. Purdy, St. Catharines. Exhibit made September 25.
Peaches—Purdy.
Awarded Silver Medal.

A. Railton, Fonthill. Exhibits made June 18, 20, July 16, 24, 26, 31, September 20, 25, 28, October 3, 10, 15, 19.
Strawberries—Clyde, Michel.
Raspberries—Cuthbert, Golden Queen, Eldorado, Gregg, Kittatinny.
Peaches—Elberta, Longhurst, Wheatland, Crosby, Late Crawford, Smock.
Grapes—Roger No. 15, Worden, Brighton, Roger No. 4, Niagara.
Awarded Gold Medal.

Allen Ramsey, Queenston. Exhibit made September 3rd.
Peaches—Early Crawford.
Awarded Honorable Mention.

J. DeW. Randall, Niagara. Exhibits made August 13, October 1, 16.
Figs—White Genoa.
Awarded Bronze Medal.

M. A. Read, Port Dalhousie. Exhibit made September 25, 28, October 1, 2, 11.
Pears—White Doyenne, Duchess, Bordeaux, President Druard, Rutter, Josephine de Malines, Winter Nelis, Paul Ambre, Dr. Reeder, Louise Bonne, Seckel, Madame Eliza, Madame, Tryoe, Swan's Orange, D'Anjou, Keiffer, Goodale, Gemsel's Burgamot, Le Conte, Kingsessing, Bosc, Clairgeau, Brockworth Park, Sheldon, Bartlett, Souvenir du Congress, Flemish Beauty, Vermont Beauty, Eastern Belle.
Grapes—Massasoit, Duchess, Moore's Early, Early Victor, Jessica, Wyoming Red, Eldorado, Prentiss, Esther, Black Delaware, Hattie, Seedling, Lincoln, Roger No. 4. Lindley, Vergennes, Roger No. 9, Creveling, Concord, Northern Muscadine, Hartford Prolific, Chippewa, Cetewayo, Seedling White.
Peaches—Barnard, Crosby, Longhurst, Hill's Chili.
Awarded Silver Medal General Exhibit.
Awarded Silver Medal Lincoln Grape.

A. T. Reid, Orillia. Exhibit made October 11.
Apples—Culvert.

George Reid, Niagara. Exhibit made September 27.
Quinces—
Apples—Fall Pippin.

Isaac Reid, Orillia. Exhibit made October 11.
Apples—Fallawater.

William Rickard, Newcastle. Exhibit made May 21, September 27, October 8, 18.
Apples—Northern Spy, Tompkin's King, Alexander, Wagner, Ben Davis, Blenheim Pippin, R. I. Greening, Stark, Fallawater, Cabbashaw, Baldwin, Golden Russet, Canada Red, English Russet, Seek-no-farther, Pennock, Fameuse, Belleflower, Ontario.
Awarded Silver Medal.

W. B. Rittenhouse, Jordan. Exhibit made August 2.
Blackberries—Taylor.

Geo. A. Robertson, St. Catharines. Exhibits made September 16, 20.
Peaches—Elberta, Longhurst, Wheatland.
Awarded Honorable Mention.

J. Robinson, Niagara. Exhibits made September 12, 26, 27.
Peaches—Globe, Late Crawford, Wheatland.
Pears—Bosc.

Apples—Northern Spy, Crab.
Awarded Honorable Mention.

Mr. Robinson, Consecon. Exhibit made October 14.
Apples—Pewaukee.

Geo. Routh, Niagara. Exhibit made October 2.
Pears—Duchess.

Charles Rowe, Orillia. Exhibit made October 15.
Apples—Ben Davis, Longfield, American Golden Russet, Pewaukee, Wealthy.

James Sandham, Queenston. Exhibits made September 3, 7, 19, 24.
Peaches—Early Crawford, St. John, Old Mixon, Longhurst.
Awarded Honorable Mention.

Mrs. Senator Sandford, Hamilton. Exhibit made October 8.
Pears—Seckel, Sheldon.

Chas. Schwenger, Hamilton (41 McNab Street). Exhibits made September 4, 9.
Plums—Burbank.
Watermelon—
Melons—Montreal Nutmeg.
Cauliflower—
Awarded Honorable Mention.

John Scott, St. Catharines. Exhibits made July 15, August 16, 19, September 20.
Raspberries—Smith's Imperial, Hilborn, Cuthbert, Gregg, Golden Queen.
Plums—Early Purple, Saunders.
Peaches—Early Rivers.
Tomatoes—Matchless.
Awarded Bronze Medal.

Stafford Scratch, Kingsville, Exhibit made August 21.
Plums—Abundance, Burbank.

C. E. Secord, St. Catharines. Exhibit made July 25, 30, August 6, 9, 12, 16, 20, 26, September 5, 9, 12, 18.
Raspberries—Cuthbert.
Peaches—Sneed, Alexander, Early Rivers, St. John, Foster, Early Crawford, Longhurst, Elberta, Late Crawford, Old Mixon.
Apples—Duchess, Alexander.
Pears—Giffard.
Grapes - Champion, Brighton, Delaware, Moore's Early, Niagara.
Cut Flowers—
Awarded Silver Medal.

John Sexton, St. Catharines. Exhibit made July 16.
Gooseberries—White Smith.
Awarded Bronze Medal.

S. Shearer, Niagara. Exhibit made September 26, 27.
Peaches—Globe, Late Crawford, Elberta.
Pears—Sheldon.
Grapes—Moore's Diamond.
Awarded Honorable Mention.

Chas. Sheer, Aldershot. Exhibit made September 4.
Watermelon—
Melon—Montreal Nutmeg.
Pumpkins—
Awarded Honorable Mention.

F. A. Sheppard, Queenston, Exhibit made September 3.
Peaches—Early Crawford, Mountain Rose.
Plums—Lombard.

J. Sheppard & Son, Queenston. Exhibit made August 6, 9, 13, 20, 27, September, 3, 7, 10, 13, 17, 20, 24, 26, October 28.
Blackberries—Lawton.
Apples—Astrakhan, Sweet Bough, Snow, Blenheim Pippin, King, Gravenstein, Baldwin, N. Spy.
Peaches—E. Rivers, St. John, Mountain Rose, Early Crawford, Coolridge's Favourite, White, Smock.
Plums—Abundance, Lombard, German Prune.
Grapes—Moyer, Champion, Moore's Early, Wyoming, Red, Green Mountain, Niagara, Brighton, Moore's Diamond, Pocklington, Woodruff Red, Worden, Lindley, Concord, Catawba.

Pears—Clapp's Favorite, Beurre Clarigeau, Keiffer.
Quinces—
Tomatoes—New Stone.
Awarded Silver Medal.

R. W. Shephard, Como, Quebec. Exhibit made October 2,
Apples—Fameuse.
Awarded Bronze Medal.

Isidore Shepley, Kingsville. Exhibit made September 25.
Apples—Snow, Wagner, Canada Red, Baldwin, Greening, Cayuga Red Streak.
Awarded Honorable Mention.

David Sinclair, Freeman. Exhibit made September 25.
Plums—Reine Claude.
Pears—Sheldon, D'Anjou.
Apples—Transcendent Crab, Golden Russet.

James Sinclair, Freeman. Exhibit made September 25.
Plums—Reine Claude.
Pears—D'Anjou.
Apples—Canada Red.

J. F. Sinclair, Aldershot. Exhibit made September 4.
Watermelon—

M. Slingerland, Niagara. Exhibit made September 27.
Apples—Swayzie's Pomme Gris.
Awarded Honorable Mention.

A. M. Smith, St. Catharines. Exhibit made June 18, 20, August 8, 16, September 9, 25, October 21.
Strawberries—Clyde, Splendid, Glen Mary, Excelsior, Williams.
Raspberries—Gregg.
Plums—Early Purple, Abundance, Red, June, Prunus Simonii, Satsuma, Glass Seedling, Burbank, Yellow Egg.
Pears—Wilder, Lawson, Souvenir du Congress, Duchess d'Anjou.
Peaches—Alexander, E. Crawford, Champion, Mountain Rose, Carlyle, Barnard, Old Mixon, Elberta, Late Crawford, Steven's Rareripe.
Quinces—
Awarded Silver Medal.

E. D. Smith, Winona. Exhibit made August 20.
Blackberries—Kittatinny.
Peaches—Triumph, Greensboro'.
Plums—Milton, Wildgoose, Saunders, Lowrey's Gage.
Awarded Honorable Mention.

J. H. Smith, St. Catharines. Exhibit made October 8.
Apples—Primate.
Grapes—Wilder, Roger No. 19, Roger No. 14.

Smith & Reed Co., St. Catharines. Exhibit made July 10.
Cherries—Tartarian.

T. Smith, St. Catharines. Exhibits made August 12, September 10, 16, 26.
Peaches—Alexander, Foster, Late Crawford.
Melons—Montreal Nutmeg.
Awarded Honorable Mention.

Robert Spence, Niagara Falls South. Exhibits made September 18, October 11.
Peaches—Crosby, Elberta, Smock, White.

D. W. Springer, Port Nelson. Exhibit made August 28.
Plums—Imperial Gage, Red Egg, Bradshaw.
Pears—Clapp's Favorite.
Awarded Honorable Mention.

S. Spillett, Nantyr. Exhibit made July 18.
Gooseberries—Champion, Ontario, Antwerp, Marion, Red Jacket, Keepsake, Columbia. Triumph, Chautauqua, Carney Seedling, Queen, Lan Lad, Green Chisel, Downing, White Smith, Golden Prolific, Dominion, Pearl, Crown Bob.

O. T. Springer, Burlington. Exhibit made August 30
Pears—Boussock, Bartlett.
Plums—Niagara.
Peaches—Early Rivers.

C. L. Stephens, Orillia. Exhibit made July 20, October 11, 18.

Gooseberries—Pearl, Industry, White Smith, Smith Improved, Warrington Red, Downing, Imperial, Seedlings No. 1, 2, 6, 10, 12, 14, 16, 19, 21, 28, 29.

Apples—Tompkin's King, Ben Davis, Golden Russet, Salome, Fameuse, Plumb's Cider, Stark, Wolf River, Wealthy, McIntosh, Tolman Sweet, Fall Dessert.

Awarded Silver Medal.

E. Stephenson, Oshawa. Exhibit made August 29.

Plums—Glass Seedling.

Apples—Whitney Crab.

E. B. Stevenson, Jordan Station.

Display of Strawberries in solution.

Awarded Bronze Medal.

Alex. Stewart, St. Catharines. Exhibits made August 2, 20.

Apples—Astrakhan, Yellow Transparent.

Awarded Honorable Mention.

F. G. Stewart, Homer. Exhibits made July 8, 11, 15, August 2, 6, 16, 26, September 3, 20, 27, October 1, 8, 14.

Cherries—Early Richmond, Yellow Spanish, Tartarian, Windsor, Montmorency.

Apples—Early Harvest, Astrakhan, Northern Spy. Yellow Transparent.

Plums—Ogon, Abundance, Niagara, Burbank, Yellow Egg.

Peaches—Alexander.

Grapes—Champion, Jessica, Moyer, Moore's Early, Rogers No. 9, Rogers No. 19, Delaware, Brighton, Salem, Rogers No. 3, Concord, Wilder, Woodruff Red, Vergennes, Worden, Moore's Diamond, Niagara, Empire State, Green Mountain, Catawba, Lindley.

Awarded Gold Medal.

Mrs. Stewart, Leamington. Exhibit made August 10.

Apples—Duchess.

J. D Strang, Moffat. Exhibit made July 13.

Currants—Cherry.

Gooseberries—Industry.

James Symington. Port Dover. Exhibit made September 25.

Grapes—Rogers No. 9. Niagara, Worden, Delaware, Wilder, Brighton, Wyoming Red.

Awarded Honorable Mention.

Geo. Sexsmith, Stone Quarry, Bertie. Exhibit made September 1.

Display of Sweet Peas.

Wilfred Thompson, St. Catharines. Exhibits made July 25, August 26, 29, September 4, 9, 12, 16, 18, 23, 27, 30, October 2, 15, 21, 23.

Cherries—Morello.

Peaches—St. John, E. Crawford, Elberta, L. Crawford, Steven's Rareripe.

Grapes—Champion, Lady, Moore's Early, Worden, Concord, Creveling, Rogers No. 4, Hartford, Clinton, Brighton, Rogers No. 2 and No. 3, Vergennes, Iona, Pocklington, Niagara, Salem, Lindley, Diana.

Apples—Baldwin.

Pears—Keiffer.

Awarded Silver Medal.

E. Thorp, Burlington. Exhibit made August 14.

Blackberries—Erie.

James Titterington, St. Catharines. Exhibits made June 18, 22, July 15, 16, 30, August 2, 5, 6, 13, 16, 19, 26, 27, 29, September 3, 10, 14, 18, October 9.

Strawberries—Clyde, Splendid, Glen Mary, Rio, Duff, Seaford, Williams, Greenville, Darling, Crescent, Excelsior, Michel, Johnson's Early.

Cherries—Montmorency.

Tomatoes—

Gooseberries—White Smith.

Plums—Willard, Ogon, Abundance, Yellow Japan, Red June, Climax, Wickson, New Bartlett, Shiro, Gold, Burbank, Washington, Paragon, Green Gage, Victoria.

Black Currants—Champion.

Peaches—Alexander, E. Michigan, Seedling.

Pears—Bartlett, Sheldon, Howell, Bosc, Clairgeau, Souvenir du Congress.

Grapes—Prentiss, Rogers No. 15, Rogers No. 44, Rogers No. 22.

Melons—Montreal Nutmeg.

Awarded Gold Medal.

Mrs. J. Titterington, St. Catharines. Exhibit made September 30.

Peaches—Seedling.

J. Tweddle, Fruitland. Exhibits made August 19, 20, 30, September 28, October 2, 16.
Apples—Yellow Transparent, Astrakhan, Duchess, Golden Russet, Fameuse, Baldwin, Kings, Greening, Northern Spy.
Pears—Lawson, Giffard, Clapp's Favorite, Howell.
Plums—Niagara, Canada Orleans, Washington, Reine Claude.
Peaches—Longhurst, Hill's Chili.
Awarded Silver Medal.

Jarl Utter, Bartonville. Exhibit made October 2.
Peaches—Smithson.

R. Vandeburg, Orillia Exhibit made October 11.
Apples—Ben Davis, Culvert.

Van Duzer & Griffith, Grimsby. Exhibits made June 20, July 11, 20, September 10, October 9.
Strawberries—Clyde.
Gooseberries—Pearl, Downing.
Currants—Cherry, Fay.
Cherries—Early Richmond, Napoleon, Black Tartarian, Montmorency, Windsor, Elkhorn, Reine Hortense.
Pears—Bartlett, Le Conte.
Awarded Bronze Medal.

W. H. Vrooman, Queenston. Exhibits made September 3, 17, 20.
Peaches—Mountain Rose, Elberta, Crosby, Old Mixon.
Awarded Honorable Mention.

Fred Truman, St. Catharines. Exhibit made July 8.
Collection of Verbenas and Foliage Plants.

J. W. Wainman, Orillia. Exhibit made October 11.
Apples—Tompkin's King, Mann, Northern Spy.

Mr. Wild, Hamilton. Exhibit made October 14.
Pears—Howell, B. Superfine, B. Clairgeau, Vicar of Wakefield, D'Anjou, Winter Nelis, Goodale.
Awarded Honorable Mention.

G. X. Walker, St. Catharines. Exhibit made September 2.
Grapes—Moore's Diamond.

J. Walker, Niagara. Exhibit made September 27.
Pears—Duchess.

E. Wallis, Orillia. Exhibit made October 11.
Apples—Fall Cooking.

Thomas Walton, Freeman. Exhibit made August 21.
Plums—Ireland's Seedling, Moore's Arctic.

J. J. Ward, Consecon. Exhibit made October 14.
Apples—St. Lawrence, McIntosh Red, Fameuse, Ontario.

W. A. Warner, Trenton. Exhibit made September 2.
Apples—Duchess, Hyslop Crab, Mann, Pewaukee, Alexander, McIntosh Red, Bietigheimer.
Awarded Honorable Mention.

W. Warnock, Goderich. Exhibit made September 23.
Grapes—Moore's Diamond, Vergennes, Wilder, Concord, Hartford, Brighton, Empire State, Merrimac, Campbell's Early, Massassoit.

Dr. T. H. Watt, Niagara. Exhibits made September 19, 26, 27.
Peaches—Longhurst, Crosby, Late Crawford.
Pears—Clairgeau, Lawrence, Sheldon.
Plums—Archduke.
Apples—Maiden's Blush.
Awarded Honorable Mention.

Russ. Weeks, Consecon. Exhibit made October 14.
Apples—Golden Russet, Betigheimer.

Salem Weeks, Consecon. Exhibit made October 14.
Apples—Wealthy

W. Weir, Niagara. Exhibits made September 27, October 2.
Pears—B. Clairgeau, Keiffer, Mt. Vernon.
Apples—Swazyie's Pomme Gris.

B. Welstead, St. Catharines. Exhibit made September 2.
Grapes—Worden, Moore's Early, Niagara.

Mrs. Whaley, Ancaster. Exhibit made October 8.
Apples—Black Detroit.
C. E. White, St. Catharines. Exhibits made July 9, 18, August 5, 12.
Cherries—Early Richmond, Montmorency.
Peaches—Alexander.
Pears—Giffard, Doyenne.
Awarded Honorable Mention.
O. F. Wilkins, Bridgeburg. Exhibits made September 10, 23.
Grapes—Bridgeburg Beauty, Seedling Canadian, Moyer, Conqueror Seedling, Eaton, Moore's Diamond, Wyoming Red, Early Ohio.
Peaches—Crosby, Elberta.
Awarded Honorable Mention.
A. H. Woodbridge, Kingsville. Exhibits made September 2, 5.
Peaches—Champion, Early Crawford.
Frank Woodruff, St. David's. Exhibit made August 6.
Blackberries—Lawton.
H. C. Woodruff, St. David's. Exhibits made August 24, September 3, 13, October 2, 8.
Grapes—Moore's Early, Green Mountain, Lindley, Niagara, Delaware, Vergennes, Concord.
Pears—Keifler.
Awarded Honorable Mention.
W. Woodruff, St. Catharines. Exhibit made September 26.
Grapes—Vergennes.
Edgar J. Woolverton, Grimsby. Exhibit made October 29.
Pears—Sheldon.
L. Woolverton, Grimsby. Exhibits made August 6, 7, 16, 22, 27, September 2, 3, October 2, 3, 4.
Currants—White Holland, Prince of Wales, London Market, Black Naples, Champion, Black Victor, Collin's Prolific.
Peaches—Schumaker, Sneed, Alexander, Early Rivers, Hynes' Surprise, E. Hilborn, Champion, Yellow St. John.
Pears—Doyenne, Early Harvest, Clapp's Favorite, Giffard, Rostiezer, LeConte, Elizabeth, Sheldon, Triumph de Vienna, D'Anjou, Winter Nelis, Clairgeau, Keiffer, Duchess.
Apples—Astrakhan.
Plums—Peach Imperial, Royal.
Quinces—Vandeman, Bentley, Orange.
Grapes—Geneva, Telegraph, Cottage, Janesville, Marin Kalin, Hartford, Prolific, Bacchus, Concord, Muscatel, Goethe, Brighton, Brilliant, Black Eagle, Empire State, Barry Mills, Haskell 4, Iona, Moore's Diamond, Kensington, Black Giant, Noah, Pearl, Missouri Reisling, Transparent, Northern Muscatine, Rogers No. 24, Dracut Amber, Rogers No. 19 and No. 30, Wyoming Red, Lindley, Duchess, Early Victor, Niagara, Perkins, Delaware, Agawam, Vergennes, Prentiss, Esther, Croton, America, Montifore, Ivers, Oneida, Ella, Maomi, Mary, Alice, Jefferson, Colerian, Salem, Rebecca, Worden, Pocklington, Triumph, Green Mountain, Eumelan, Elvira, Martha, Norfolk, Eldorado, Faith, Gairtner, Diana, Northern Light, Victoria.
Awarded Gold Medal.
J. B. Young, Niagara Falls South. Exhibit made September 28.
Pears—D'Anjou, Sheldon, Clairgeau, Bosc, Kirtland.

Miscellaneous Exhibits.

Province of Ontario. Exhibits made May 20, continuous.
Installation of Exhibit.
Awarded Silver Medal.
Province of Ontario. Exhibit made May 20, continuous.
300 Jars Assorted Canned Fruits.
Awarded Silver Medal.
Province of Ontario. Exhibit made July 1, continuous.
General Display of Native Wines.
Awarded Gold Medal.
Province of Ontario. Exhibit made July 1, continuous.
50 Bottles Fruits in Solution.
Awarded Bronze Medal.
Shuttleworth & Harris, Brantford. Exhibits made May 20, continuous.
General Display of Pickles and Relishes.
Awarded Silver Medal.

Prof. H. L. Hutt, Ontario Agricultural College, Guelph. Exhibit made July 1, continuous.
96 Jars Assorted Fruits in Solution.
Awarded Silver Medal.
G. C. Caston, Craighurst. Exhibits made May 20, continuous.
36 Jars Fruit in Solution.
Awarded Honorable Mention.
L. Woolverton, Grimsby. Exhibits made May 20, continuous.
40 Jars Fruit in Solution.
Awarded Bronze Medal.
Ontario Fruit Growers' Association.
Horticultural Literature.
Awarded Bronze Medal.
R. J. Graham, Belleville. Exhibits made July 1, continuous.
24 Jars Evaporated Fruits and Vegetables.
Awarded Bronze Medal.
Ontario Grape Growing & Wine Manufacturing Co., St. Catharines. Exhibits made May 20, continuous.
Display of Native Wines.
Awarded Bronze Medals.
J. S. Hamilton & Co., Brantford. Exhibits made July 1, continuous.
Display of Native Wines, Brandies, and Champagnes.
Awarded Bronze Medal.
E. Girardot Wine Co., Sandwich. Exhibits made July 1. (Continuous).
Display of Native Wines.
Awarded Bronze Medal.
L. M. Schenck & Co., St. Catharines. Exhibits made May 20. (Continuous).
Display of Assorted Canned Fruits and Vegetables.
Awarded Honorable Mention.
A. Bain, Springbank Mineral Water Co., St. Catharines. Exhibits made July 1. (Continuous).
Display of Mineral Water.
Awarded Honorable Mention.
Spramotor Co., London. Exhibits made May 20. (Continuous).
Collective display of Spraying and Whitewashing Machinery and Spray Pumps.
Awarded Gold Medal.
Ontario Experiment Stations. Exhibits made September 12.
General display of Fruits in Season. 250 plates.
Awarded Wilder Silver Medal.
M. Pettit, Winona. Exhibit made September 12.
General display of Out-door Grapes. 110 varieties.
Awarded Wilder Silver Medal.
Albert Pay, St. Catharines. Exhibit made September 12.
General collection of Fruits in Season. 120 plates,
Awarded Wilder Silver Medal.
W. M. Orr, Fruitland. Exhibit made September 12.
General collection of Fruits in Season.
Awarded Wilder Bronze Medal.

Decorative Contributions.

Department of Agriculture, Toronto	Collection of Pictures.
Frank Coy, St. Catharines	Mounted Deer's Head and Pictures.
Dr. F. S. Kilmer, St. Catharines	Mounted Deer's Head.
Dr. A. May, St. Catharines	Mounted Deer's Head and Pictures.
E. J. Lovelace, St Catharines	Mounted Deer's Head.
R. Thompson, St. Catharines	Mounted Deer's Head.
Albert Pay, St. Catharines	Mounted Deer's Head, Birds and Pictures.
Dr. J. H. Comfort, St. Catharines	Mounted Birds.
E. Hack, St. Catharines	Mounted Bird.
Wm. Carter, Glencoe	Picture, Fruit Scene.
Wm. Houston, Central Prison, Toronto	Collection of Palms and Decorative Plants.

Summary.

Total number of Exhibitors	326
Total number of varieties of Fruit shown	577
Total number of Plates displayed	8,650
Total number of Awards given	215

VEGETABLE EXHIBIT IN AGRICULTURE DEPARTMENT.

Awarded Honorable Mention.

Province of Ontario ....Display of Peppers.
James Titterington, St. Catharines ....Matchless Tomatoes.
" " ....Ruby King Peppers.
" " ....Egg Plant.
" " ....Sweet Potatoes.
" " ....Montreal Nutmeg Melons.
John W. Blain, " ....Seedling Tomatoes.
C. W. Ashbaugh, Mohawk................Matchless Tomatoes.
" " ....Fanny Clyde Tomatoes.
J. A. Leckie, Clarkson.....................Italian Vegetable Marrow Squash
" " ....Marrow Dark Green Squash.
" " ....Vegetable Marrow Squash.
J. F. Sinclair, Aldershot.................Watermelon.
" " ....Watermelon.
C. Scheer, " ....Montreal Nutmeg Melon.
Chas. Schwenger, Hamilton ....Montreal Nutmeg Melon.
" " ....Cauliflower.
Gordon Bunting, St. Catharines............Hackensack Melon.
" " ....Hackensack Melon.
Thomas Smith " ....Montreal Nutmeg Melon.
T. R. Merritt " ....Round Purple Egg Plant.
" " ....Long Purple Egg Plant.
J. Sheppard & Son, Queenston ....Ignotum Tomatoes.
John Scott, St. Catharines ....Matchless Tomatoes.
Albert Pay, " ....Hackensack Melons.
R. L. Huggard, Whitby ....Tomatoes.
John Dunn, St. Davids ....Ponderosa Tomatoes.

Silver Medals.

Albert Pay, St. Catharines................Asparagus.
George Boyt " ....Asparagus.

FLORICULTURAL EXHIBITS.

Gold Medals.

John H. Dunlop, Toronto ....Tender Roses.
H. H. Groff, Simcoe ....Gladioli.

Silver Medals.

J. Gammage & Son, London ....Carnations.
John H. Dunlop, Toronto...........................Carnations.

Bronze Medals.

W. J. Lawrence, Mimico.............................Tender Roses.
The H. Dale Estate, Brampton ....Tender Roses.
R. Cameron, Niagara Falls ....Dahlias.

Honorable Mention.

T. J. Farmer, Port Dalhousie ....Dahlias.

Mr. John H. Dunlop was awarded the only Gold Medal for tender roses on his exhibit of about 400 blooms.

Mr. H. H. Groff's awards for Hybrid Gladioli consisted of the following :

Pan-American Exposition Gold Medal.
Pan-American Silver Vase, awarded by Buffalo Florists Club.
Certificate of Merit, by Society of American Florists and Ornamental Horticulturists.
Thirteen first prizes by Pan-American Exposition.

VARIETIES OF APPLES.

Arctic
A. Pippin
Antonovka
Alexander
Autumn Strawberry
Beauty of Kent
Ben Davis
Belle Russett
Boikon
Baldwin
Bretigheimer
Blenheim
Black Detroit
Bailey Sweet
Belleflower
Baxter or La Rue
Barcelona Pearmain
Bismarck
Blunt
Bush Sweet
Chenango Strawberry
Canada Red
Cross
Colvert
Cranberry
Coo's River Beauty
Cabbachie
Duke of Connaught
Duchess of Oldenburg
E. Spitzenburg
Eicke
English Russett
Edgehill
Fameuse
Fall Orange
Fall Pippin
Fallawater
Gideon
Gano
Gravenstein
Greening
Garden Gem
Grand Sultan
Golden Russett
Golden Sweet
Gloria Mundi
Gravel Pippin
Gibson
Grimes' Golden
Hawthorne
Hawthornden—New
Hubbardston
Hamilton
Hawley
Haas
Holland Pippin
Isham
Ingram
Isabella
Jenneting
Kentish Fillbasket
King
Jelliflower
Lowell
La Victoria
McIntosh Red
Mother
Maiden's Blush
Mann
Magog Red Streak
McLean
Maggie's Favorite
Mann Pippin
Munson's Sweet
Mammoth Black Twig
Milwaukee
Melinda
Missouri Pippin
McMahon White
North Star
Northfield Beauty
Northern Spy
Norcaster Spy
Northwestern Greening
Ontario
Old Pearmain
Peter
Pewaukee
Primate
Palouse
Pennock
Pumpkin Sweet
Pound
Peerless
Pioneer
Phoenix
Parlin
Patten Greening
Princess Louise
Pound Sweet
Plumb's Cider
Peck Pleasant
Quebec Winter Sweet
Russell
Ribston Pippin
Roxbury Russett
Rochelle
Reinette
Rolfe
Red Russett
Repka Winter
Scarlet Pippin
St. Lawrence
Stump
Saxon
Schweitzer
Swayzie's Pomme Gris
Sweet Bough
Strawberry Pippin
Starr
Salome
Stark
Seek-no-farther
Scott's Winter
Shiawassee Beauty
Striped Winter
Twenty Ounce
Trenton
Tolman Sweet
Van Morris Reinette
Wolf River
Wagner
Wealthy
Windsor Chief
Wharton
Washington Strawberry
Winter Maiden's Blush
Western Beauty.

VARIETIES OF GRAPES.

Amber
Aleita
Alice
Brighton
Brilliant
Black Delaware
Baccus
Black Eagle
Black Giant
Concord
Creveling
Champion
Clinton
Catawba
Cottage
Colerain
Chippewa
Cetewayo
Croton
Cambridge
Concord Muscat
Diamond
Delaware
Duchess
Diana
Dracut Amber
Empire State
Eaton
Early Ohio
Early Victor
Early Dawn
Eldorado
Esther
Etta
Eumelian
Elvira
Green Golden
Green Mountain
Geneva
Hartford
Hattie
Haskell
Herbert
Iona
Isabella
Ivers
Jessica
Jefferson

VARIETIES OF GRAPES—*Continued.*

Janesville
Kensington
Lady
Lincoln
Moore's Early
Moyer
Martha
Marion
Mills
Missouri Reisling
Montefore
Mary
Niagara
Noah
Northern Muscadine
Naomi
Norfolk
Northern Light
Oleita
Oneida
Pocklington
Prentiss
Pearl
Perkins
Rogers 1
" 3
" 4
" 9
" 15
" 19
" 22
" 28
" 30
Rogers 34
" 39
" 41
" 44
Rebecca
Regina
Triumph
Telegraph
Tocolon
Transparent
Vergennes
Victoria
Worden
Wyoming Red
Woodruff Red
Winchell.

VARIETIES OF PEARS.

Angouleme, Duchess de
Anjou
Bartlett
Bosc
Bergamot
Beurre Gris
Brockworth Park
Boussock
Buffum
Clairgeau
Clapp's Favorite
Comice, Doyenne du
Diel
Druard President
Dr. Reider
Doyenne de Etle
Eastern Belle
Flemish Beauty
Frederick Clapp
Giffard
Giant Morceau
Goodale
Gray Doyenne
Hardy Beurre
Howell
Idaho
Japanese Golden Russett
Keiffer
Kingsessing
Lawrence
LeConte
Lawson
Louise Bonne de Jersey
Lucrative Belle
Le Abbe de Paris
Malines, Josephine de
Mount Vernon
Onondaga
Rutter
Rostezer
Seckle
Sheldon
Souvenir du Congress.
Superfine
Tyson
Triumph de Vienna
Vermont Beauty
White Doyenne
Wilder
Winter Nelis.

VARIETIES OF PEACHES.

Alexander
Amsden June
Brigden or Garfield
Bronson
Coolridge's Favorite
Centennial
Chair's Choice
Champion
Chili Hill's
Carlisle
Crosby
Duke of York
Early Rivers
Early Michigan
Early Barnard
Early Crawford
Elberta
Fitzgerald
Foster
Georgia, Belle of
Globe
Golden Drop
Greensboro'
Hale
Hynes' Superfine
Hilborn
Honest John
Hortense Rivers
Jacques' Rareripe
Longhurst
Late Crawford
Late Rareripe
Lemon Free
Millionaire
Mrs. Brett
Mountain Rose
McLide's Seedling
Old Mixon Free
Purdy
Pratt
Pearce's Yellow
Reeve's Favorite
Richmond
Smithson
Smock
Sneed
Steven's Rareripe
St. John
Stump
Susquehanna
Tyhurst
Triumph
Wager
Waterloo
Wheatland
Yellow Rareripe
Yulu
Kalamazoo
Namaper
Mary's Choice
Oscar's Black Prince
Red Rivers.

VARIETIES OF PLUMS.

Abundance
Arch Duke
American Violet
Burbank
Bradshaw
Berkmans
Beauty of Naples
Belle de September
Botan
Chabot
Common Blue
Coe's Golden Drop
Carman's Seedling
Canada Orleans
Duane's Purple
Diamond
Damson
Early Purple
Ford's Early
Fox
Green Gage
Glass Seedling
General Hand
Gueii
German Prunes
Grand Duke
Galbraith
Gold
Imperial Gage
Ireland's
Imperial Blue
Kingston
Lowell's Seedling
Lucy Grieve
Lowrey's Gage
Loveland
Lombard
Magnum Bonum
Moyer
Marianna
Montreal Beauty
Monarch
McLaughlin
Moore's Arctic
New Bartlett
Niagara
Normands
Orient
Orange
Ogon
Orleans Golden
Peach Imperial
Purple Egg
Prunus Simoni
Prince of Wales
Paragon
Pond's Seedling
Quackenboss
Royal
Reine Claude
Red Diamond
Reine Des Mirabelles
Red Egg
Red June
Shipper's Pride
Stoddart
Shiro
Satsuma
Staunton
Sugar
Smith's Orleans
Shropshire
Victoria
Washington
Willard
Wickson
Wray's Seedling
Yellow Egg.

VARIETIES OF STRAWBERRIES.

Aroma
Brandywine
Bubach
Bismarck
Clyde
Corsican
Crescent
Duff
Darling
Excelsior
Glen Mary
Greenville
Gladstone
Gandy
Haverland
Johnson's Early
Lovet
Michel
Marshall
Margaret
New York
Nick Ohmer
Pride of Cumberland
Ruby
Rio
Sample
Splendid
Seaford
Saunders
Tennessee Prolific
Vandevere
Van Deman
Williams
William Belt
Wilson
Warfield
Woolverton.

VARIETIES OF CHERRIES.

Black Tartarian
Black Heart
Cleveland
English Morello
Early Purple
Elkhorn
Early Richmond
Governor Wood
Montmorency
Napoleon Biggariau
Olivet
Reine Hortense
Seedling
Schmid's Biggariau
Windsor
Yellow Spanish

VARIETIES OF RASPBERRIES.

Cuthbert
Gregg
Golden Queen
Hilborn
Marlboro'
Smith's Imperial
Turner.

VARIETIES OF BLACKBERRIES.

Eldorado
Erie
Kittatinny
Lawton
Snider
Taylor
Western Triumph.

VARIETIES OF CURRANTS.

Black Naples
Black Champion
Brayley's
Belle de St. Giles
Cherry
Cream Drop
Collins' Prolific
Fay's Prolific
Lee's Prolific
New Victoria
North Star
Prince Albert
Pomona
Raby Castle
Red Dutch
Red Cross
Saunders' Black
Versaillaise
Victoria
Wilder
White Imperial
White Grape.

VARIETIES OF GOOSEBERRIES.

Antwerp
Crown Bob
Champion
Columbia
Chautauqua
Carney's Seedling
Downing
Dominion
Green Chisel
Golden Prolific
Golden Ball
Industry
Keepsake
Lan Lad
London
Marion
Ontario
Pearl
Queen
Red Jacket
Smith's Improved
Steven's Seedlings
Triumph
Warington Red
Wellington
White Smith.

EIGHTH ANNUAL REPORT

OF THE

FRUIT EXPERIMENT STATIONS

OF

ONTARIO,

UNDER THE JOINT CONTROL OF THE

ONTARIO AGRICULTURAL COLLEGE, GUELPH

AND THE

FRUIT GROWERS' ASSOCIATION OF ONTARIO

1901.

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TORONTO.

EIGHTH ANNUAL REPORT

OF THE

ONTARIO FRUIT EXPERIMENT STATIONS

1901.

To the Honorable John Dryden, Minister of Agriculture:

Sir,—We have the honor to submit to you the Eighth Annual Report of the Fruit Experiment Stations of Ontario. Hitherto our experimenters have been reporting on older varieties; you will observe that now they are able to include many new varieties of later planting. Our work will now constantly grow upon our hands, and will require closer attention from your officers if the full benefit of our tests are to be given to the public.

We have the honor to be, Sir,

Your obedient servants,

Jas. Mills, Chairman.
Linus Woolverton, Secretary.

BOARD OF CONTROL, 1902.

REPRESENTING THE COLLEGE.

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W. M. ORR .... Fruitland.
A. H. PETTIT .... Grimsby.
LINUS WOOLVERTON, M.A., (*appointed by Minister*) .... Grimsby.

EXECUTIVE COMMITTEE.

Chairman—JAMES MILLS, M.A., LL.D.
Secretary—LINUS WOOLVERTON, M.A.
Official Visitor—H. L. HUTT, B.S.A.

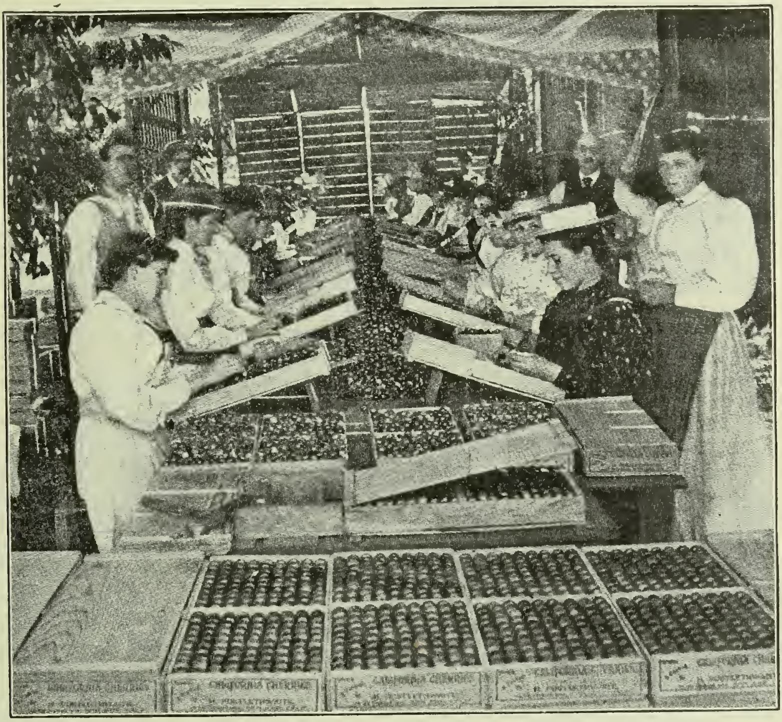
THE ONTARIO FRUIT STATIONS.

	Name.	*Specialty.*	*Experimenter.*
1.	Southwestern	Peaches	W. W. HILBORN, Leamington.
2.			
3.	Wentworth	Grapes	MURRAY PETTIT, Winona.
4.	Burlington	Blackberries and Currants	A. W. PEART, Freeman.
5.	Lake Huron	Raspberries	A. E. SHERRINGTON, Walkerton.
6.	Georgian Bay	Plums	J. G. MITCHELL, Clarksburg.
7.	Simcoe	Hardy Apples and Hardy Cherries	G. C. CASTON, Craighurst.
8.	East Central	Pears and Commercial Apples	R. L. HUGGARD, Whitby.
9.	Bay of Quinte	Apples	W. H. DEMPSEY, Trenton.
10.	St. Lawrence	Hardy Plums and Hardy Pears	HAROLD JONES, Maitland.
11.	Strawberry Station		E. B. STEVENSON, Jordan Station
12	Gooseberry Station		STANLEY SPILLETT, Nantyr.
13.	Maplehurst	General collection of all kinds of fruits for descriptive work for "Fruits of Ontario"	L. WOOLVERTON, Secretary.
14.	Algoma	Hardy Fruits	C. YOUNG, Richard's Landing.
15.	Wabigoon	Hardy Fruits	A. E. ANNIS, Dryden.

FRUITS OF ONTARIO.

DESCRIBED AND ILLUSTRATED BY MR. L. WOOLVERTON, SECRETARY OF THE ONTARIO FRUIT EXPERIMENT STATIONS.

Fruit growing has become so important an industry in the Province of Ontario, that it deserves every encouragement at the hands of the Department of Agriculture. The Canadian farmer who contemplates growing fruit asks for information on two points in particular, viz., (1) What fruits shall I plant, and (2) How shall I cultivate them? The latter of these questions it is the province of the Ontario Fruit Growers' Association to answer through the Canadian Horticulturist and the Annual Report, while the former question is one that can be solved only by years of patient experimental work by our fruit experiment stations.

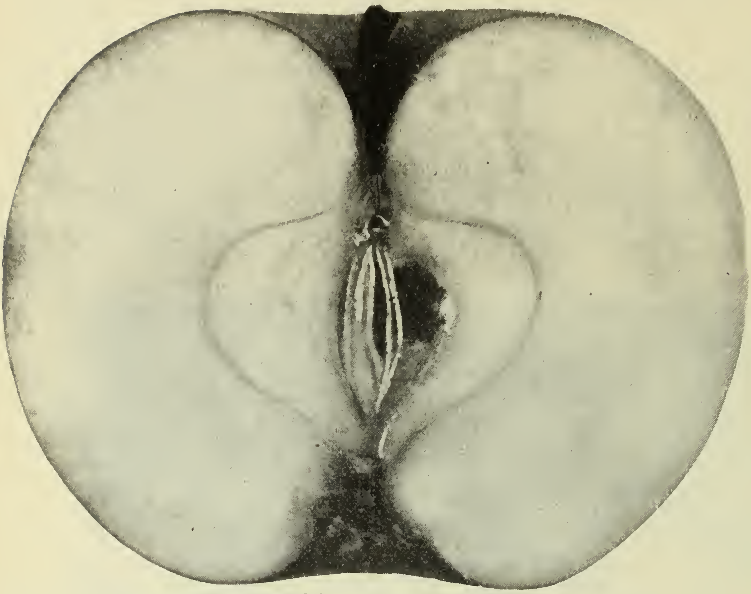


CHERRY PACKING IN CALIFORNIA.

Of equal importance is some means of identifying all varieties now grown in our Province, and of knowing with some degree of exactness the size, color, general appearance and real value of these varieties aside from the catalogues of the nurserymen. To meet this latter need, the Secretary, with the advice and approval of the Board of Control, has begun the work of illustrating and describing the fruits of Ontario; and in this work he desires to acknowledge the valuable aid of the various fruit experimenters. The illustrations are all new and original, having been engraved from photographs made the exact size of the fruit samples, except where otherwise specified, and in this way there will in time be made accessible to the Ontario fruit growers a complete guide to all the fruits grown in the Province. Such a work necessarily must be slow and tedious, but it is all important that it should be characterized by scientific accuracy, and the writer invites notes or criticism from pomologists generally.

BLENHEIM.

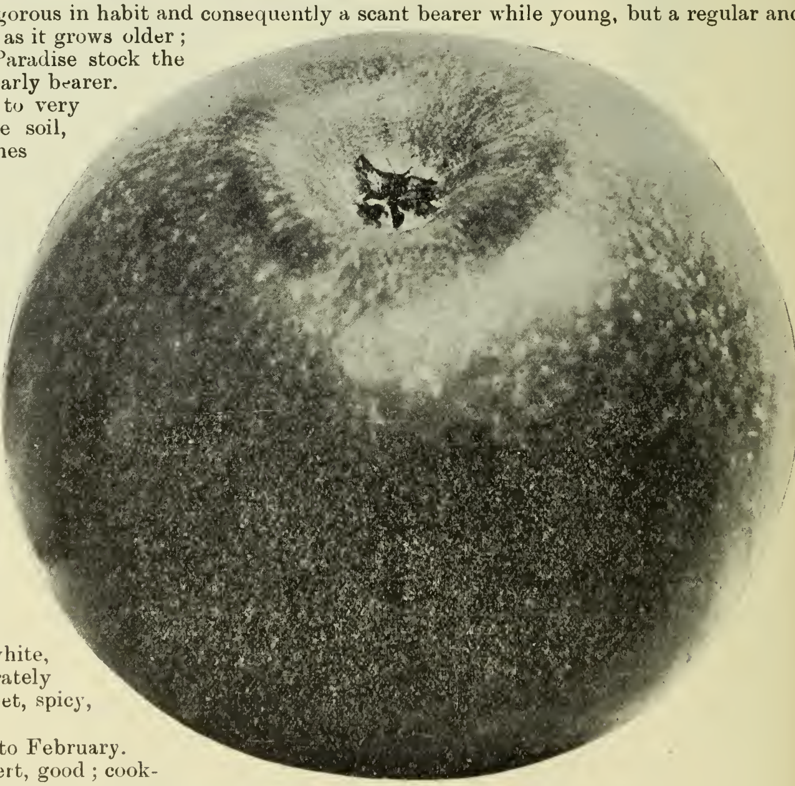
(*Blenheim Orange, Blenheim Pippin, Woodstock.*)



An apple that is constantly gaining in favor with both grower and consumers, because of its size, its beauty, its evenness of form and general excellence for cooking and dessert purposes. It is grown in the counties of Prince Edward, Victoria, Lincoln and elsewhere, and is highly valued as a commercial apple. It certainly deserves to be more generally planted.

Origin: A garden in Woodstock, England, near the residence of the Duke of Marlboro'; shown at a meeting of the London Horticultural Society in 1819, and introduced into France in 1840.

Tree: Very vigorous in habit and consequently a scant bearer while young, but a regular and abundant bearer as it grows older; dwarfed on the Paradise stock the tree becomes an early bearer.



Blenheim.

Fruit: Large to very large on favorable soil, averaging 3 inches high by $3\frac{1}{2}$ broad; form, roundish oblate, slightly smaller at the apex than at the base, very regular; color yellowish, splashed with dull red on sunny side and streaked and with deep red dots small and distinct; stem, short, $\frac{3}{4}$ in. long, stout, in a large russetted cavity; calyx, large and very open, with short segments placed in a large, green cavity.

Flesh: Cream white, fine, crisp, moderately juicy; flavor, sweet, spicy, slightly acid.

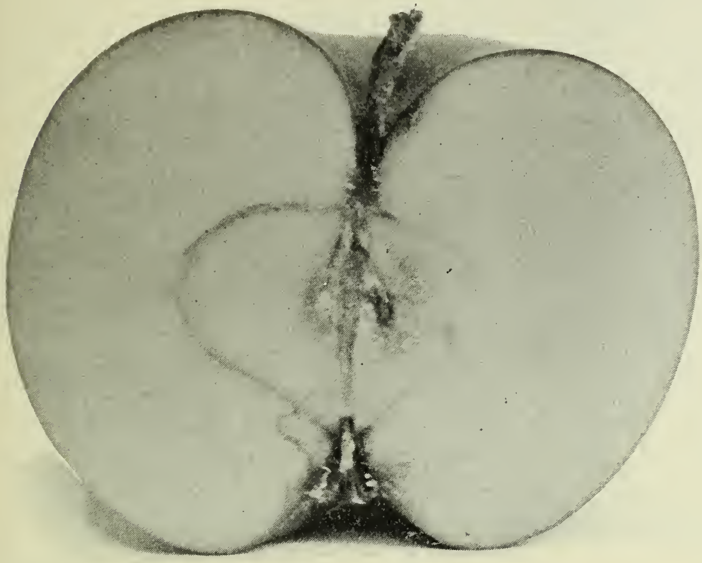
Season: Nov. to February.

Quality: Dessert, good; cooking, very good.

Value: Home and foreign markets, first-class.

Adaptation: Ontario, south of latitude $44\frac{1}{2}$.

FALL PIPPIN.



A general favorite as a fall cooking apple, and possessing a fairly good flavor as a dessert apple. It wasat one time planted very freely, but of late years it has been discarded because of its liability to the apple scab.

Origin: America, probably from seed of Holland Pippin.

Tree: Habit, stout, vigorous. spreading; head round; longevity, some trees in Niagara district are now over 100 years of age; fairly productive.

Fruit: Large, $3\frac{1}{2}$ x $3\frac{1}{4}$ inches; form, roundish, sometimes obscurely ribbed; skin, yellow, often with red cheek and a few small grey dots; stalk, half to three quarters of an inch, set in a small, moderately deep cavity; calyx, small, open in a small, moderately deep basin.

Flesh: Greenish white; texture, tender, mellow, and fairly juicy; flavor, brisk, pleasant, aromatic.

Season: November and December.

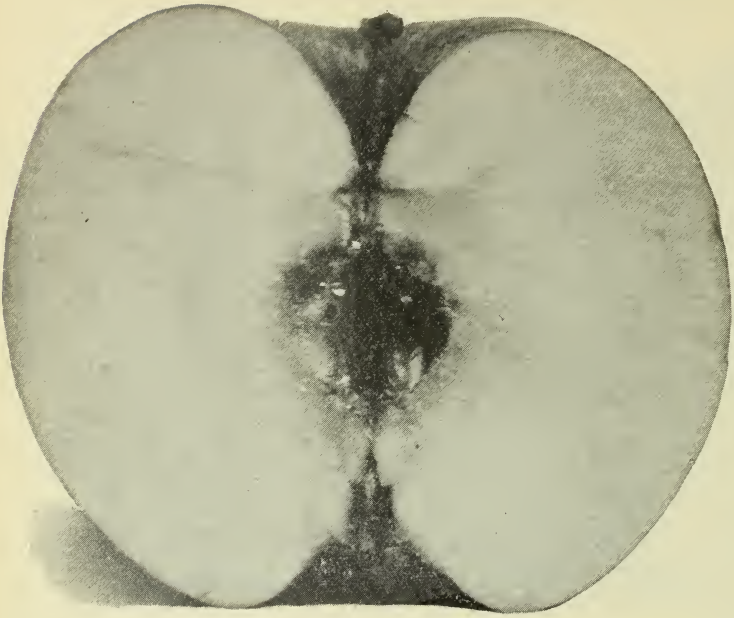
Quality: Dessert, fair; cooking, very good.

Value: Home market, good; distant market, poor.

Adaptation: Hardy in the apple districts, but very subject to scab.

FALL PIPPIN.

GRAVENSTEIN.



A favorite commercial apple in Nova Scotia, but altogether too little cultivated in Ontario, considering its many excellent characteristics. It has no competitor it its season for either home use or market.

Origin : According to Hogg, the original tree grew in the garden of the Duke of Augustenberg, at the Castle of Grafenstein in Schleswic-Holstein in Germany, and was still standing about the year 1850. Leroy inclines to accept a statement by Hirschfelt, a German pomologist, who in 1788 wrote the first description of the apple, and stated that it was brought to Germany from Italy. The earliest trace of this apple we can find dates back to about 1760. It is now widely grown in Western Europe, and is a favorite everywhere.

Tree : much more vigorous in growth than ordinary varieties, and when in bloom remarkably beautiful with its extraordinary sized pure white blossoms ; hardy and productive.

Fruit : large to very large, the sample photographed was 3 inches long by $3\frac{3}{4}$ broad ; form oblate conical, somewhat one sided and more or less pentagonal ; skin, greenish yellow to orange, beautifully striped and splashed with two shades of red ; stem, stout, about $\frac{1}{2}$ inch in length, set in a deep, narrow cavity ; calyx partially closed, wide long segments, set in a wide irregular, slightly russet basin.

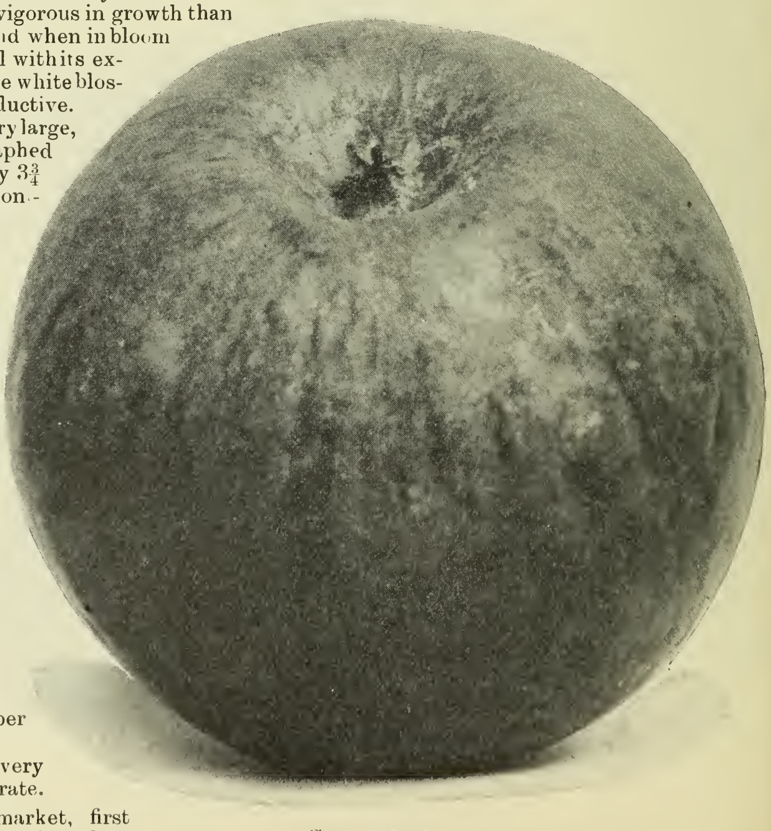
Flesh : White ; texture, crisp and very juicy ; flavor rich, vinous and aromatic.

Season : September to October.

Quality : Dessert, very good ; cooking, first rate.

Value : Home market, first class ; foreign market, first class.

Adaption : General in the apple sections.



GRAVENSTEIN

PRIMATE.

A fine dessert apple for the home garden ; too tender for distant shipment.

Origin : Uncertain ; probably Western New York.

Tree : Hardy, very vigorous, symmetrical, very productive.

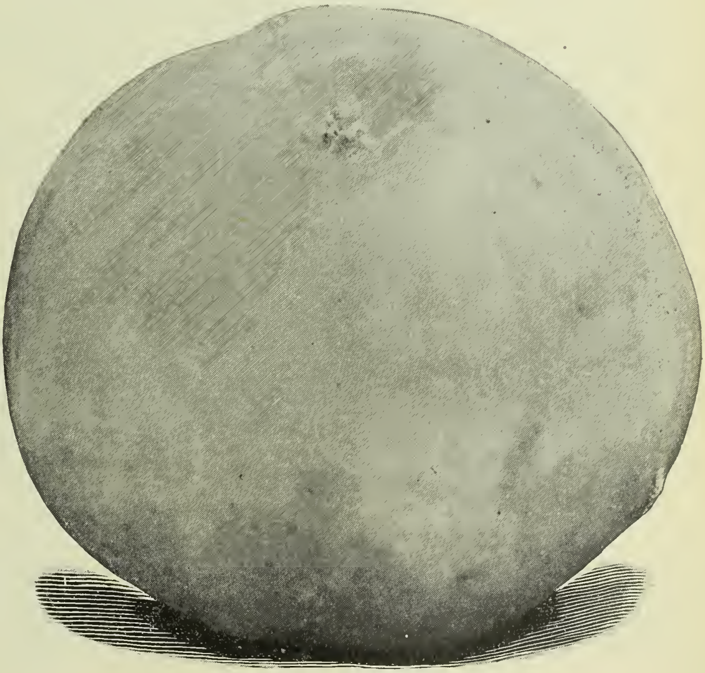
Fruit : Above medium, $2\frac{1}{2}$ inches long by $3\frac{1}{4}$ broad ; form oblate conical ; skin, light yellow, with crimson blush on sunny side ; stem about one inch long, inserted in a large deep furrowed cavity ; Calyx, closed in an abrupt, moderately deep, somewhat corrugated basin.

Flesh : Color, white ; texture, tender, juicy, with a very pleasant, sub acid flavor.

Season : August and September.

Quality : Dessert, very good ; cooking, good.

Value : Home market, good ; foreign market, poor.



PRIMATE.

GRAPES.

JESSICA.

An excellent dessert grape for the amateur's garden.

Origin: Canada; a seedling raised by W. H. Read of Port Dalhousie, introduced by Mr. D. W. Beadle of St. Catharines, and first described in the *Canadian Horticulturist* for February, 1884.

Vine: Fairly vigorous, hardy and healthy.

Bunch: Five inches long by $3\frac{1}{2}$ inches broad, shouldered, compact.

Berry: Medium, $\frac{1}{2}$ to $\frac{5}{8}$-inch in diameter; color, yellowish green to white; skin, thin; pulp, tender, juicy; flavor sprightly, aromatic, sweet and very agreeable, free from foxiness.

Quality: Very good for dessert.

Season: Last of August.

Value: Market, too small; home uses, very good.

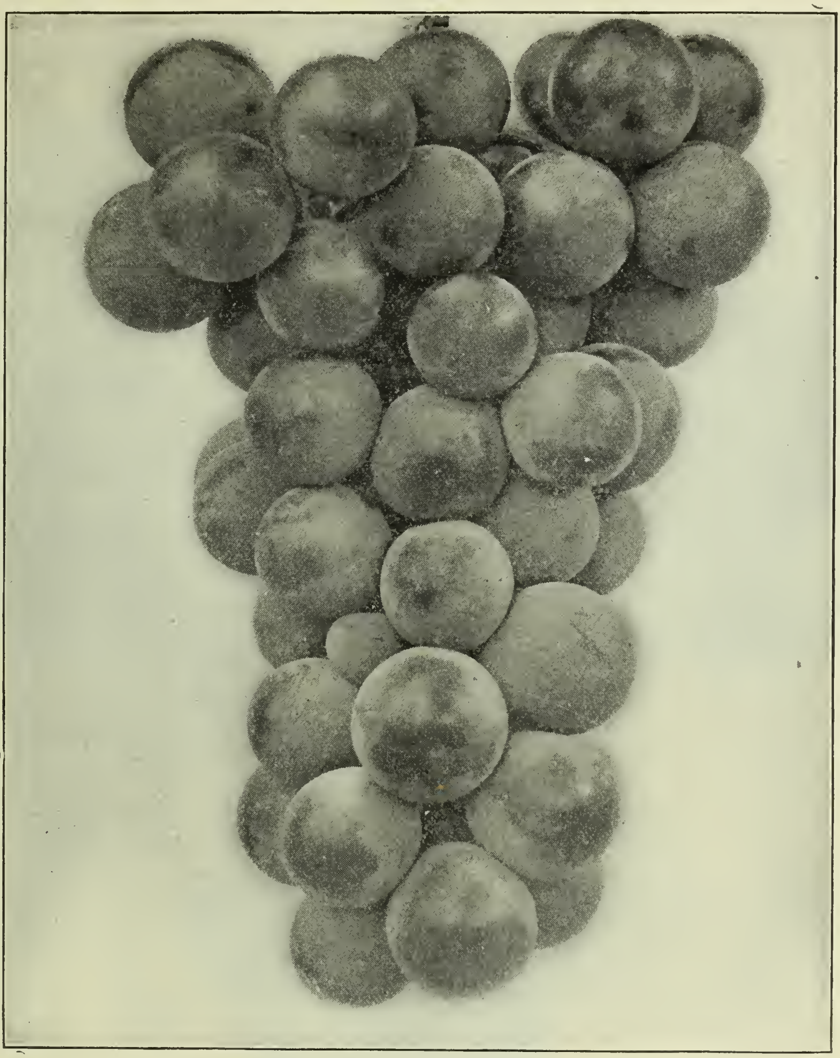
Adaptation: General.

JESSICA

WORDEN.

A seedling of the Concord, the Worden naturally much resembles that well-known variety indeed, the vines of these are almost identical in character and appearance.

When first introduced it was thought to be superior to the Concord as a market variety for the main crop, but it has proved to be superior only in its earliness, ripening a few days in advance of its parent. Otherwise, it is not equal to the latter, for its skin is more tender, rendering it unfit for distant shipment, while, if left hanging, it cracks open very badly, and at the the same time loses flavor.



WORDEN.

Origin : S. Worden, Minnettoo, N.Y., from Concord seed.

Vine : Strong, vigorous grower, with coarse stout foliage, dark green above, rusty underneath ; very hardy, healthy and very productive, often yielding at the rate of three tons per acre.

Bunch : Large, compact, shouldered.

Berry : Large, black ; skin tender, thin, with heavy bloom, cracks easily ; flesh sweet when well ripened ; pulp tender, and loses flavor soon after ripening ; a poor keeper.

Season : Middle to end of September.

Quality : Second rate for dessert purposes.

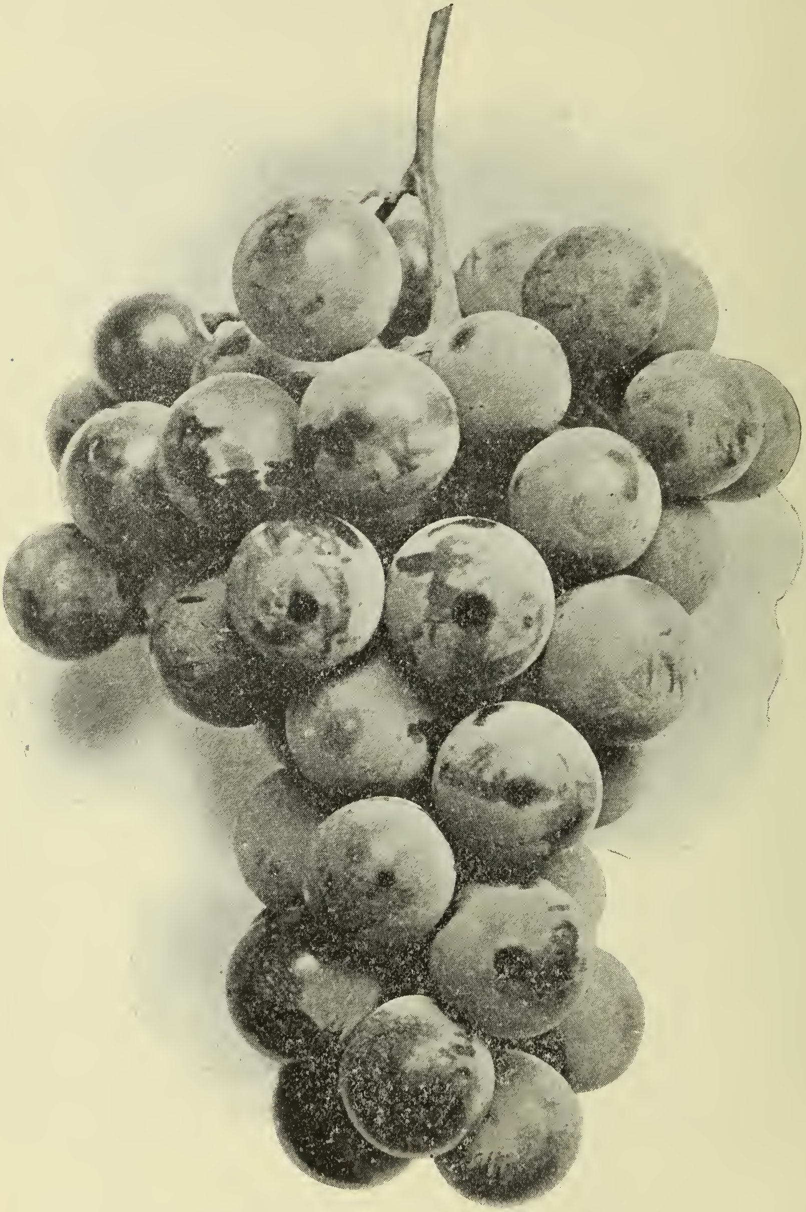
Value : Second rate for near market and fourth rate for distant market.

Adaptation : Well suited to the northern sections because of its early ripening.

REQUA.

(Rogers 28.)

A fine table grape, supposed to be too late for Canada, but ripening well in the Niagara district. A sample of the kind of grape which should be grown for export, but the vine is



REQUA.

scarcely productive enough to be profitable.

Origin : E. S. Rogers, Salem, Mass.; a hybrid between the Wild Labrusca, or Mammoth Fox grape, of Massachusetts, and a European variety. Mr. Rogers produced his seedling in 1856, and at first introduced them by their numbers only.

Vine : Fairly vigorous and moderately productive.

Bunch : Large, shouldered, moderately compact, but somewhat poor.

Berry : Large, round ; skin thin, wine color with thick bluish bloom ; pulp, tender, juicy ; flavor, sweet, sprightly ; seeds, two or three, of medium size.

Quality : Dessert, very good. Value : First class for home or foreign market.

Season : September, October and November.

PEACHES.

CROSBY PEACH.

(*Excelsior, Hale's Hardy.*)

A peach of good quality, but not large enough for the commercial orchard.

CROSBY.

Origin : Massachusetts 1876, by Mr. Crosby, nurseyman ; named Excelsior by the Massachusetts Agricultural College ; Hale's Hardy because Mr. J. H. Hale was the first grower to plant it extensively, and finally Crosby by the United States Division of Pomology.

Tree : Vigorous, healthy, fairly hardy and very productive.

Fruit : Medium size, 2 inches to $2\frac{1}{4}$ inches in either diameter ; form almost round, slightly one sided ; color yellow, with bright red cheeks, very pretty ; cavity deep, abrupt ; apex small in a slight depression ; suture traceable.

Flesh : Color, bright yellow, red at the stone ; texture fine, moderately juicy, tender ; flavor sweet and very agreeable.

Season : September 29th to October 5th.

Quality : Very good for dessert, and good for cooking.

Value : Good for home market.

HYNES.

A very good early dessert peach, but the fruit is inclined to rot in wet seasons.

HYNES.

Origin : Introduced in 1895 by Mr. S. D. Willard of Geneva, N.Y.

Tree : Vigorous and productive, but somewhat subject to yellows.

Fruit : Roundish, slightly one-sided ; size, medium, about 2 x $2\frac{1}{4}$ inches ; color, greenish white with bright red cheek, sometimes deep red in the sun ; cavity, narrow and deep ; suture, distinct ; dots, numerous ; skin, thin and tenacious ; stone, semi-cling.

Flesh : Color, yellowish white ; texture, juicy ; flavor, sweet and agreeable.

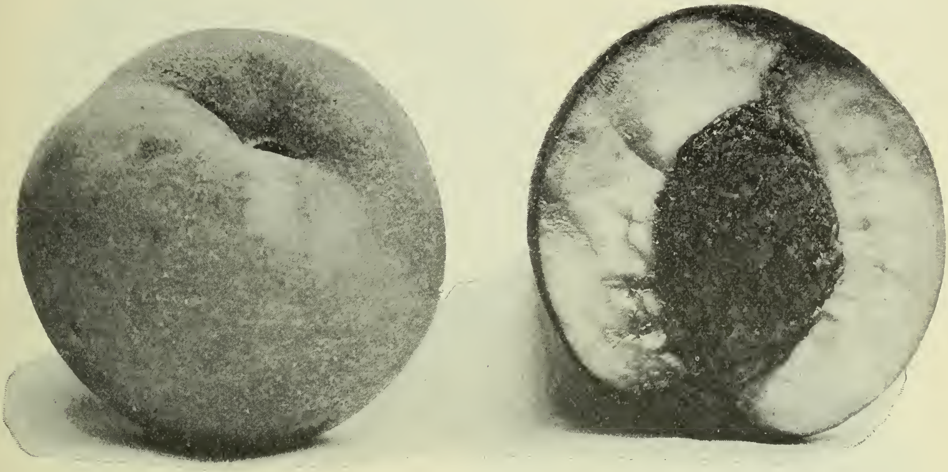
Season : August 10th to 25th.

Quality : Dessert, good to very good.

Value : Home market, good ; distant market unsuitable.

SNEED.

A promising early variety for home use and near markets.



Sneed.

Origin : Tennessee, by Judge Sneed of Memphis, about 1880, from a pit of the Chinese Cling.

Tree : Vigorous, but slender in young growth, productive, an early bearer.

Fruit : Medium, about 2 x 2 inches ; form, roundish oval, slightly one-sided ; skin, light greenish white, with red cheek, and short thick down ; cavity, narrow and deep, with distinct suture, and a small pointed apex, in a slight depression.

Flesh : Semi-cling ; color, yellowish white at maturity ; texture, tender, fine, very juicy ; flavor, mild, vinous, pleasant.

Season : July 20th to 30th, 1900.

Quality : Dessert, good.

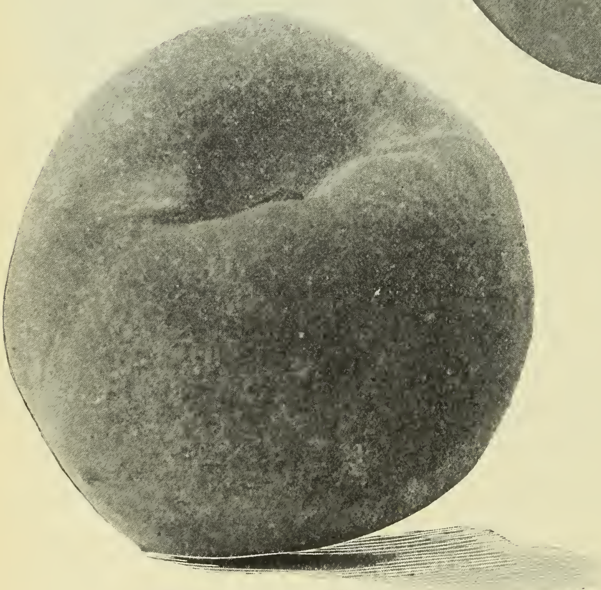
Value ; Home market, fair ; distant market, useless.

TRIUMPH.

A valuable commercial variety, to follow the Alexander, but not very popular on account of its heavy coat of down, its dull color, and its susceptibility to rot.

Origin : Georgia, seed of Alexander.

Tree : Vigorous, hardy, very productive, subject to twig blight and leaf curl.



Triumph.

Fruit : Two inches long by $2\frac{1}{2}$ broad ; form, roundish, somewhat shouldered and flattened ; color, yellow ground nearly covered with red and markings of very dark red ; cavity, deep ; apex, small, in a decided depression ; suture, distinct ; pit, semi-cling.

Flesh : Yellow ; texture, fine, juicy ; flavor, sweet, rich and excellent.

Season : August 15th to 20th.

Quality : Good.

Value : Home market, very good.

Adaptation : Michigan, Ontario and New York.

MANNING.

(Manning's Elizabeth.)

A pretty little pear, desirable in the amateur's garden, but too small for the commercial orchard.

Origin: In Louvain, in 1819, by Van Mons, who sent scions to America in 1832, to the Massachusetts Horticultural Society. Mr. Manning, having been asked by Van Mons to give it a name, called it in 1840 Elizabeth of Van Mons, but Downing in 1842 proposed that it be called Manning's Elizabeth, to honor the zeal of this horticulturist in importing new fruit trees. In order to keep in line with the best pomologists of to-day and make the names of fruits as short as convenient, we propose to call it Manning.

Tree: Healthy, of medium vigor, shoots dull red, very productive.

MANNING.

Fruit: Size, 2 x 2½ inches; form, regular, obovate, swollen towards the base; color, bright yellow, covered on the basal half with a deep brownish red, which often spreads over the sunny side; stem, one inch in length, swollen at the top, often set in an oblique depression; calyx open, set in a shallow basin.

Flesh: Color, creamy white; texture, fine, buttery, moderately juicy; flavor, sweet, rich, aromatic.

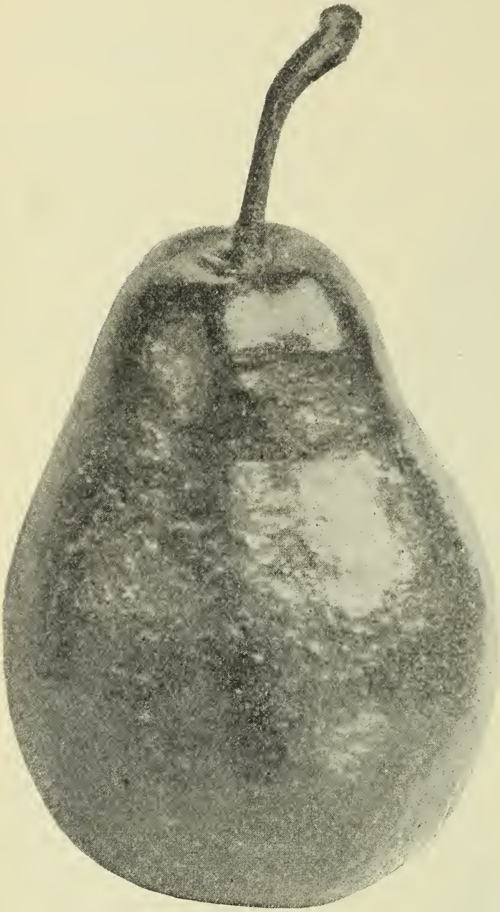
Season: August 15th to 20th.

Quality: Very good for dessert or pickling.

Value: Poor for market purposes.

LOUISE.

(*Louise Bonne de Jersey.*)



An excellent export pear if well grown. This and the Duchess have long held the first place as market varieties with growers of dwarf pears in Ontario.

Origin : At Avranches, France, about 1780, by Mr. Longueval, and named after Madame Louise de Longueval. About 1827, grafts were secured by Andre Leroy of Angers. The original tree is said to be still standing.

Tree : Hardy in southern Ontario, succeds better on quince than on pear stock ; a vigorous, upright grower ; very productive, if well cultivated and set in deep, rich sandy loam.

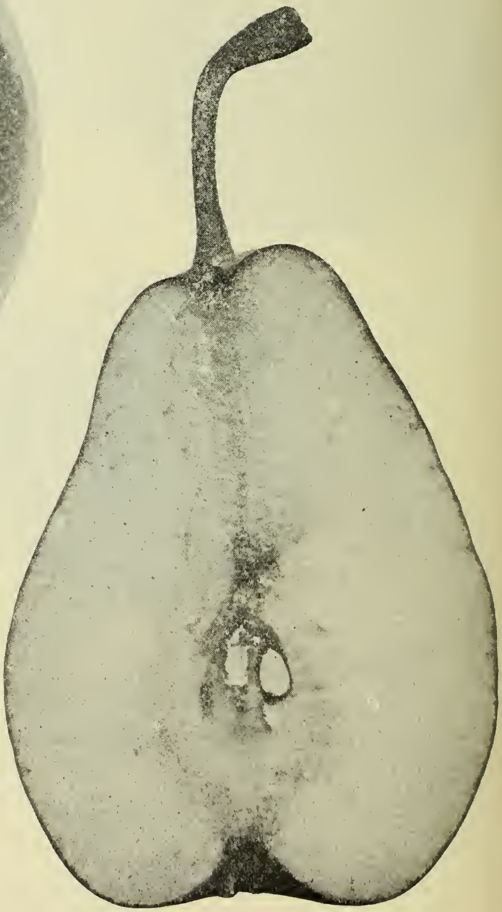
Fruit: Large, often $3\frac{1}{3}$ inches in length by $2\frac{1}{2}$ inches in width ; form, pyriform, sides usually unequal ; skin, smooth, yellowish green with brownish red cheek, with numerous red and brown dots ; stem, one to one and a half inches long, usually fleshy at insertion on one side, somewhat swollen at each extremity, set in a very slight, if any, depression ; calyx, half closed, set in a wide, shallow, slightly plaited, basin.

Flesh · White ; texture, fine grained, juicy, buttery, melting ; flavor, pleasant, aromatic.

Season : September 15th to October 15th.

Quality : Very good for dessert purposes.

Value : Home market, fair ; foreign market, first class.



LOUISE.

BUFFUM.

BUFFUM.

Formerly this pear was much in favor as a profitable orchard variety, because of its productiveness and the wonderful hardiness and vitality of the tree, but of late years it is much ess in favoi with pear growers on account of its small size and ordinary quality. Some trees of this variety at Maplehurst, forty years planted, have never shown the slightest tendency to blight, and have attained a great height, more resembling Lombardy poplars than pear trees.

Origin : Rhode Island.

Tree : Remarkable for its vigorous, symmetrical, erect habit of growth ; it is regularly and fairly productive, but, unless gathered early, the fruit drops badly ; not subject to blight.

Fruit : medium size, obovate, slight oblong, sometimes $2\frac{3}{4}$ inches long by $2\frac{1}{2}$ inches wide ; skin, rough, yellow at maturity, with bright or dull red or russet on sunny side ; dots, small, brown ; stalk, $\frac{3}{4}$ inch long in a small cavity ; segments of calyx small, in a small basin.

Flesh : Yellowish white, crisp, not fine, not juicy, sweet with pleasant flavor.

Season : September.

Quality : Dessert, fair ; cooking, fair.

Value : Home market, poor ; distant market, very poor.

Adaptation : Counted hardy in Bruce and Huron counties ; slightly tender in North Ontario county.

HARDY.

(Beurre Hardy.)

A good variety for the month of October, for both home use and market.

Origin : Boulogne, France, dedicated to M. Hardy, director of the gardens of Luxembourg, Paris.

Tree : Fairly vigorous and productive, and forms a fine symmetrical tree, especially when grown on the quince. The fruit is uniform in size and the skin is a bright clear russet.

HARDY.

Fruit : Average size, 3 inches long by 2½ inches broad ; form, obovate, obtuse pyriform, of smooth regular outline ; skin, yellowish green, with numerous russet dots and covered with light brown russet, especially at the ends ; stem, about an inch in length, stout, with fold at the base, and inserted obliquely in a small depression ; calyx, large, open, in a shallow basin ; flesh, white, fine grained, buttery, juicy, with rich aromatic flavor.

Season : October.

Quality : Dessert, very good ; cooking, good.

Value : Home market, good ; not yet exported from from Ontario, but exported with success from California to Great Britain.

WILDER.

A valuable early market pear, being beautiful in appearance, of fair size and very good flavor ; probably the best of its season, but inclined to rot at the core, if left hanging on the tree.

WILDER.

Origin : Chance seedling on south shore of Lake Erie.

Tree : Vigorous, very productive, and an early bearer when grafted on the quince.

Fruit : Fair to large in size, 2½ to 3 inches in diameter ; form, ovate, obtuse pyriform, sometimes shouldered at stem , color, greenish yellow, with deep red cheek and numerous grey dots ; stem, stout, ¾ to 1 inch in length ; calyx, open.

Flesh : White, tender, fine grained ; flavor, sweet, aromatic and very pleasant.

Season : August 12th to 25th.

Quality : Dessert, very good.

Value : Home market, excellent.

VICAR.

Vicar of Winkfield (Hogg); Curé (Leroy).

A French pear considerably grown in Ontario as a winter pear, but it does not reach its best perfection in our climate and does not deserve a place in our orchards.

Origin: Found wild near Clion, France, by M. Leroy, curate of Villiers-en-Brenne, in the year 1760; distributed in France under sixteen different names; introduced into England by the Rev. W. L. Rham, Vicar of Winkfield, in Berkshire, hence its English name.

Tree: Vigorous, but somewhat susceptible to blight, very productive.

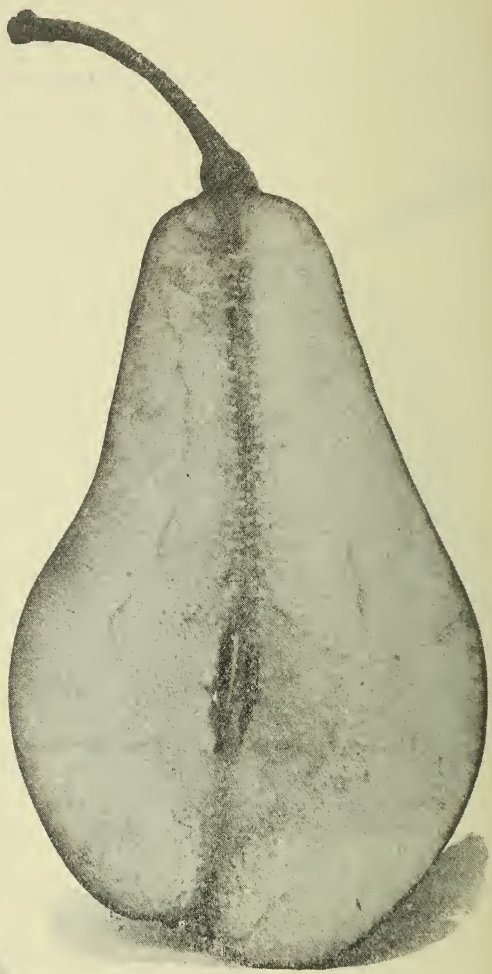
Fruit: Large, sometimes reaching 4 inches long by $2\frac{1}{2}$ broad, and in France it is claimed to reach $5\frac{1}{2}$ inches long by $3\frac{1}{2}$ broad; more often in Ontario it averages the size of our engraving; form, long pyriform, one sided; skin, green, seldom tinged with brown on the sunny side, and marked with small brown dots; stem, usually $1\frac{1}{2}$ inches long, fleshy at base, and inserted obliquely without a cavity; calyx, open, with large segments, set in a shallow basin.

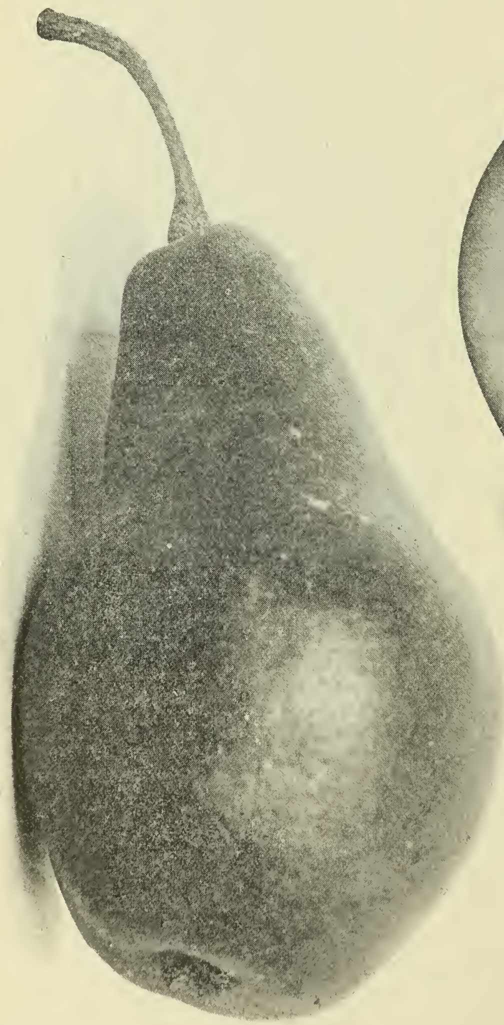
Flesh: Greenish white, firm, not very juicy as grown in Ontario; flavor, fair, if well ripened.

Season: December to February.

Quality: Dessert, very poor; cooking, fair.

Value: Home market, poor; foreign market, poor.





VICAR.

FRUIT EXPERIMENT STATIONS.

REPORT ON THE INSPECTION OF THE FRUIT EXPERIMENT STATIONS.

By Prof. H. L. Hutt, Ontario Agricultural College, Guelph.

Through the progressiveness of Mr. G. C. Creelman, Director of Farmers' Institutes, a series of Orchard Institute meetings was arranged for in various parts of the Province last summer, and wherever possible these meeetings were held at the Fruit Experiment Stations. I had the pleasure of attending quite a number of these meetings and giving talks on a few of the most important points in connection with orchard management. These meetings have helped greatly to bring the people of the sections where the meetings were held in more direct touch with the work of the stations.

Through the untiring efforts of W. L Smith, editor of the *Weekly Sun*, who attended every meeting possible, excellent reports were published in the *Sun* of each meeting, which, no doubt, helped greatly to widen the influence of station work generally.

As these orchard meetings were held during the early part of the summer, I found it advisable to visit some of the stations later on in the season when the varieties of fruits grown there could be studied to the best advantage.

The Burlington Station, A. W. Peart, Burlington, Experimenter: On May 24th, the first of the Orchard Institute meetings was held at the Burlington Experiment Station. Unfortunately the day was cold and wet, otherwise there would no doubt have been a large attendance. As it was, however, there were about one hundred present; and because of the unfavorable weather, the lunch and the programme of music and speeches which followed was entered into with extra zest. Between the showers, a walk was taken through the orchards and fruit plantations, all of which showed that they received first-class care and attention. Mr. Peart gave a practical talk on his methods.

On August 21st, I again visited Mr. Peart and found him very busy with his plum harvest. The trees were well loaded, and he would probably have about 2,000 baskets of plums. Pears also were a good crop, most of the trees of a bearing age being well loaded. Many of the young trees set out in the experimental orchard in 1896 and 1897 are now coming into bearing. The Wilder, a promising early variety, was in season at the time of my visit, and was of exceptionally fine appearance and excellent quality.

Scions of thirty-nine varieties of apples were sent to Mr. Peart for grafting last spring. These were worked upon bearing Roxbury Russets. Nearly every graft had been successful, and the scions had made good growth.

Young trees of six other varieties had been sent for planting, and have been put for the present in nursery rows. Of most of these there were from six to ten trees of a kind. This is rather more than any of the experimenters should be asked to plant of an untested variety. At most three of a kind should be plenty.

Mr. Peart has put out another plantation of blackberries, in which all of the varieties sent for testing some years ago have been included. A lot of careful work has been done in testing currants, and the full results of these tests will be given in Mr. Peart's report.

The Simcoe Station, G. C. Caston, Craighurst, Experimenter: On June 6th, I attended an Orchard Institute meeting at Mr. Caston's. There were about eighty of the farmers of the neighborhood present, and much interest was taken in the work of the station. After a formal meeting in the hall on the place, Mr. Caston gave valuable information on the kinds of fruits he had found best adapted to that part of the country.

His orchards and fruit plantations were in excellent condition, and most fruits with the exception of apples, promised a good crop. The cherries, of which Mr. Caston has a good collection, were particularly well loaded.

The Bay of Quinte Station, W. H. Dempsey, Trenton, Experimenter: On June 12th, an orchard Institute meeting and basket picnic was held at our experimenter's, Mr.

W. H. Dempsey, Trenton. About 200 people were present. After the lunch baskets had been emptied, an interesting and profitable afternoon was spent, in the fruit house and orchards, when such questions as cultivation, spraying, pruning, grafting, budding, etc., were discussed and illustrated. Mr. Dempsey gave a practical talk on the varieties he had tested, and mentioned those he considered best for home use, and those he had found most profitable for the foreign market.

The orchards were at that time in a fine state of cultivation. As in most other sections, there was promise of but a light crop of apples, although the Fameuse trees were making a good showing.

On October 12th, four months later, I again visited Mr. Dempsey and found him in the midst of his apple picking. He had picked about 450 barrels of Fameuse, and estimated his entire crop at about 1,000 barrels, not half his usual crop, still much above the average crop this year. The varieties making up the bulk of his crop were Fameuse, Seek-no-Further, Northern Spy, Roxbury Russet, Golden Russet, Ontario and Stark. His early apples were a good crop and brought excellent prices. Such varieties as Duchess, Astrachan, Trenton, Alexander, and Wealthy sold at $3 per barrel for first grade, and $2.65 for second grade fruit.

The young trees in the experimental orchard have made good progress and are coming into fruiting. Among the many new varieties which have been introduced into the older orchard by means of grafting, there are a number of quite promising ones which will be mentioned in Mr. Dempsey's report.

The East Central Station, R. L. Huggard, Whitby, Experimenter: On my way back from Trenton, June 12th, I visited Mr. Huggard's station at Whitby. The experimental trees at this station are in two separate orchards. The north orchard contains most of the young apple and pear trees planted in 1896 and 1897. This orchard had been well cultivated, and the trees were making a good growth The land between the trees was being cropped again with potatoes and roots. The south orchard contains the bearing apple and pear trees as well as the plums and some of the young pear trees. Owing to the wet season and scarcity of help, this orchard had at that time not been cultivated, although a coating of manure had been applied and plowing had just been started.

As elsewhere, apples were evidently going to be a light crop, although the pears and plums gave promise of a good crop. Many of the young experimental trees will be in bearing this year, and will probably be noted in Mr. Huggard's report.

The South western Station, W. W. Hilborn, Leamington, Experimenter: An excellent institute meeting was held at the home of Mr. W. W. Hilborn on the afternoon of June 14th. There were present about 60 or 70 of the fruit growers of that neighborhood, who showed their interest in the work by the active way in which various phases of orchard management were discussed. Mr. Hilborn gave valuable information relative to the varieties of peaches and plums he had already tested.

Since the severe frost of three years ago, when the greater number of the peach trees in this section were winter killed, there has been a great deal of replanting; but in many cases the trees have not made satisfactory growth. Whether this is due to the weakening of the trees from fumigation or severe winter weather has not yet been determined. Mr. Hilborn's orchards are well cared for, and what bearing trees he has left are looking well. The peach and cherry trees gave promise of only a fair crop, but the plums, particularly a number of the Japan varieties, were well loaded.

The Lake Huron Station, A. E. Sherrington, Walkerton, Experimenter: On June 18th, I visited Mr. A. E. Sherrington, Walkerton, and addressed a largely attended orchard meeting. About 300 people were present, many having driven in from a long distance. Much interest was taken in looking over the orchards and in discussing the various questions regarding orchard management.

Mr. Sherrington's orchards and small fruit plantations were all in excellent condition, and his trees were all showing great promise of a crop His apple trees were better loaded than any I have seen this year, and the young plum trees in the experimental blocks were particularly heavily loaded, and would require thinning. Good progress is being made at this station, and Mr. Sherrington will this year have excellent results to report.

THE GRIMSBY STATION, L Woolverton, Experimenter: It was arranged by the Director of Institutes that a series of orchard meetings should be held on June 20th, in the Grimsby section to visit the fruit farms of Mr. W. M. Orr, E D. Smith, M. P., Mr. M. Pettit, Mr. L. Woolverton, and others in that section; but, unfortunately, heavy rains interfered somewhat with the plans. A small meeting gathered at Mr. E. D. Smith's in the forenoon, where after being hospitably entertained we were taken for a drive through the nurseries. The weather having cleared in the afternoon, the trolley was taken to Mr. Woolverton's, where a tramp was taken through his orchards and fruit plantations. Mr. Woolverton led in a running discussion on varieties, and methods of orchard practices as we went from one kind of fruit to another, and before the meeting dispersed he gave a practical talk on the packing and shipping of fruits for the Old Country market.

On Sept. 10th, I again visited Mr. Woolverton, and found him busy getting off an experiment shipment to Glasgow of two car-loads of Bartlett pears.

At this station is a great collection of all kinds of fruits that can be grown in Onttario, from which Mr. Woolverton is gleaning notes for his descriptive and illustrated work on the "Fruits of Ontario." His young experimental orchards of cherries, plums, peaches, and dwarf pears are now nicely into bearing. On account of the exceptionally wet spring, there was not as good a crop this year as usual.

THE GEORGIAN BAY STATION, John Mitchell, Clarksburg, Experimenter: On June 25th, another orchard meeting was held at the fruit farm of our experimenter John Mitchell, Clarksburg. The meeting was well attended, many of the most prominent fruit growers of that section being present. The orchards were inspected, and a profitable discussion was held upom the various methods of orchard practice. Mr. Mitchell's orchards are a sight well worth seeing. He has about 150 varieties of plums now in bearing, and gave his experience as to those he had found most profitable, and what he considered the most promising of the new ones. There was promise of a good crop of fruit in both the apple and plum orchards, and Mr. Mitchell will no doubt be able to give a valuable report upon some of the newer varieties of plums.

THE SIMCOE GOOSEBERRY STATION, Stanley Spillett, Nantyr, Experimenter: This Station was visited July 12th, about the best time to see the bushes in fruit. No regular meeting has been arranged for at this point, but the indefatigable editor of the *Sun* and a number of the neighbors were present to learn what was being accomplished.

Mr. Spillett's crop of gooseberries was much better this year than usual, as there was much less mildew on the English varieties than has been for several years. There was enough, however, to show that these varieties cannot be depended upon. The American varieties—Champion, Downing, Pearl, and Red Jacket were all free of mildew and heavily loaded with fine fruit. Whitesmith and Green Chisel were making the best show among the English varieties. Mr. Spillett's plantation is well cared for, and he is propagating largely his best varieties.

THE ST. LAWRENCE STATION, Harold Jones, Maitland, Experimenter: An orchard Institute meeting was held at this Station on June 12th, the same day as that held at Trenton; for this reason, I could not be present. The meeting was in charge of Mr. H. Jones and Prof. W. T. Macoun, of the Central Experimental Farm, Ottawa.

I visited Mr. Jones on Aug. 29th, and found his orchards in their usual good condition. Last year his bearing orchard, mostly of Fameuse and Scarlet Pippin, produced about 750 barrels. This year the crop would not be more than half of that, but was much better than the average in most parts of the Province. Great difficulty was experienced in getting spraying done last spring, owing to the frequent rains, but all bearing trees were sprayed four times and were fairly free of scab. The trees not bearing were sprayed but once, and on these the foliage was badly affected with the fungus.

In the young experimental orchard, quite a number of the early bearing varieties are beginning to bear. Some of the trees known to be of inferior varieties were grafted to better sorts, and in all his grafting Mr. Jones has been very successful.

The plum and pear trees are on the whole not doing so well as the apples, and it is evident that quite a number of the varieties under test will be unsuitable for this section. Some varieties, however, promise well, and will be mentioned in Mr. Jones' report. About 160 young apple trees were set out last spring.

All of Mr. Jones' trees received good attention, his method being to cultivate thoroughly the early part of the season, and to follow after midsummer with a luguminous cover crop.

THE WENTWORTH STATION. M. Pettit, Winona, Experimenter: Mr. Pettit's vineyards and orchards were visited Sept. 10th. He happened to be away at the time judging fruit at the London exhibition, so that I did not have a chance to talk over the work with him.

As usual, however, at this station everything has been kept in good condition, and excellent opportunity is now offered for the study of varieties. As mentioned in last year's report, comparatively few of the many new varieties of grapes tested here have proven worthy of more extended trial. After a full report this year, Mr. Pettit might well be allowed to pull out or graft over all varieties in his experimental vineyard that are clearly shown to be not worth growing.

There are about forty varieties of plums and a number of peach trees being tried at this station, and nearly all of these trees bore an excellent crop this year. Many of the varieties have turned out not true to name, and Mr Pettit will have quite a task ahead of him getting them all identified and properly labelled.

I thought it was hardly necessary to visit this year the plantations of our strawberry experimenter, Mr. E B. Stevenson, or the "Pioneer Farm" at Dryden. At the former, Mr. Stevenson procures all his own plants, and his excellent reports are always forthcoming.

At the "Pioneer Farm," Dryden, Mr. Annis could have done little more this year than make another start with the stock sent to him.

The Algoma Station, at Richard's Landing, St. Joseph Island, was visited last summer by Mr. Orr, one of Board, who will no doubt be willing to give us a full account of what he saw. In a letter received from Mr. Young, our experimenter there, he referred to quite serious winter killing of the trees, which had been experienced last winter, due to the wet season and la e continued growth of the trees the previous fall.

VISIT TO ALGOMA STATION.

I visited the Algoma Station on the farm of Mr. Chas. Young, at Richard's Landing, on Aug. 23rd.

The location of the experimental plot is excellent, and the care, including cultivation, good. However, a root crop which was growing in the orchard was rather too close to the trees to give them every chance.

The winter of 1900-1 caught fruit trees of all kinds in that locality in full foliage, and with wood immature. As a consequence some trees were killed, especially cherries, plums, and pears. Some of the Japan plums, e. g., Abundance and Burbank, however have a little fruit this season.

Eight varieties of crab apples planted by Mr. Young, prior to the establishment of the experimental station, were well loaded with splendid fruit. Duchess of Oldenburg, Wealthy, Scott's Winter, Fameuse, and Gideon were bearing a good crop of fine apples.

Summer and fall fruits grow in abundance and of excellent quality, but there is felt the want of a good winter apple to take the place of Spy, Baldwin, and Greening, which will not do well so far north.

Mr. Young has a seedling just coming into bearing, which is a strong vigorous grower with heavy, rich foliage. The fruit is green, of medium size, fair quality, and promises to be a good keeper.

W. M. ORR.

GENERAL NOTES BY EXPERIMENTERS.

ALGOMA FRUIT STATION.

APPLES There are now in test at this station twenty-two varieties of apples, grafted on the root, besides several other varieties top-grafted, principally on Talman and Longfield stock. The fall of 1900 was very trying to young fruit trees. The warm, moist

growing weather continued right into winter; in fact experimental trees went into winter still growing. As might be expected, this caused a larger percentage of loss than there would have occurred if the wood had ripened up well. A few of the trees planted in 1899 bore slightly this year, viz, Longfield, Scott's Winter, and Wolf River. Trees were protected by a strip of cedar bark bound to the trunk; a few, by way of experiment, received a thick coat of wash compound of soft soap and wood ashes. I think possibly this is as good a protection against sun scald in the spring as any other, besides being a permanent benefit to the tree. The following are the losses during the winter of 1900 and 1901:—Blenheim Orange, three; Sweet Bough, three; Red Bietigheimer, two; Red Astrachan, two; Rolf, two; Stark, three. Several of these however were killed by being girdled by mice. You will see that the hardy varieties suffered equally with the more tender kinds, so that the loss sustained was not to be accounted for by the tenderness of the tree but by the condition in which it went into winter.

The apple crop in bearing orchards this year was rather above the average both for fall and winter fruit. Every year some new variety is coming to the front and proving just a little better than anything we had before; for instance, Golden Russet has taken the place of Scott's Winter, and Longfield bids fair to take the place of our old stand-by Wealthy. I have seen several specimens of Ben Davis, but it will have to improve vastly in size and appearance to be worth anything here. Among Crabs we have nothing better than Martha and Hyslop. I still find there is more money is Duchess than in any other apple, and the supply is not equal to the demand yet. The curculio, from which hitherto we have been free, has made its appearance this year, not to any extent certainly, but still it is here now and will doubtless increase

CHERRIES have all done well. They are healthy and are making a good thrifty growth Several of them planted in 1899 fruited this year. From experience, such as I have had, English Morello and Montmorency are the most satisfactory. There has been no loss among cherries, except two which were girdled by mice.

PEARS are doing better than I expected. The trees are thrifty and making satisfactory growth. Just how they will do when they come into bearing I cannot say; meantime I would not recommend extensive planting.

PLUMS. At the risk of disagreeing with preconceived opinions I must still maintain that Japans are better suited to our northern climate than the Europeans I have no trees give me more satisfaction in watching their growth and handsome appearance than Japan plums. I would not like to say that they are all alike hardy. I do not think they are, and perhaps in another year I will be able to say which have done best with me. Several have fruited this year, and all came through the winter well. I have fifteen varieties under test.

All trees have received clean cultivation; roots and small fruits are grown between the rows; the trees are sprayed in the experimental plot principally to keep down the aphis. Bearing trees in the old orchard are sprayed with Bordeaux and Paris green. I find that in the formula usually given the quantity of Paris green is not quite enough to produce the desired effect; $\frac{1}{3}$ more, using plenty of lime, would I think be better.

STRAWBERRIES. Of nine varieties under test, Clyde is the best. The crop this year was enormous. All were satisfactory except Saunders, which on my ground is worthless. They are grown in a matted row, and one crop taken off and then plowed under. I am unable to give the yield, and can only say they were the best crop of strawberries I ever saw.

RASPBERRIES have not done so well. Here again my experience is at variance with the majority of others, as Cuthbert has not done at all well; it is altogether too tender; the canes kill too far back. Loudon is much better, in fact the best so far. Black Caps are of no use. The weight of snow broke the canes off by the ground. I have twelve varieties under test, and I cannot say that any have brought a decent crop to maturity. I have planted a few rows on different soil which may do better.

BLACKBERRIES. Of ten varieties, Agawam has so far proved the best, but I would not care to recommend any one here to plant them. Perhaps the best use I could suggest would be a row inside the fence of the apple orchard; it might help to keep the little boy pest down.

CURRANTS AND GOOSEBERRIES have done very well. Between Downing and Pearl there is very little difference; either is better than any of the English kinds. Among

the six varieties of currants I cannot say that any one is the best, but all do well if the bush is kept open and well manured. Perhaps Cherry and Versailles are as good as any, but all are perfectly hardy.

GRAPES I have eight varieties, and they have done better this year. A few imperfect bunches were produced. Only the early kinds are of any use here, at least nothing later than Concord, and although it may color, even that will not ripen fit to eat every year.

CHAS. YOUNG.

BAY OF QUINTE STATION.

The season opened with promises of a good year; not a heavy show of bloom, but fair, and as the bud was bursting, on came heavy rain, together with a cold wave, which lasted for many days, and this no doubt caused a very light set of apples. Plums were out of bloom, hence a fair crop; also some of the pears set well.

The wood growth has been good on all, and formed a good showing of fruit buds for next year.

Of the plums that fruited this year Burbank paid the best, as it ripened its fruit before the Brown Rot came on. Of some varieties not a plum ripened; they were all destroyed by Brown Rot. Abundance was good, but there were only a few plums of it. Gold, planted 1898, had a few plums; they looked the most attractive of any, but are of little value when you taste them. Wickson also had a few, which were fine.

Of the pears, Dr. Jules Guyot is the most promising. It resembles the Bartlett in form and color; ripe first week in September; it is not as good as Bartlett in quality; very productive. Duchess Precoce is a heavy cropper, but very poor quality; ripens after the Bartlett. Idaho bears good crops, and of good quality, similar in form to Sheldon. Two Keiffer trees, planted in 1895, bore five pecks each of fine large pears, and have made the largest growth of any of the pear trees. The peach trees have made a fine growth each year, and have a good showing of fruit buds at present; they have not been killed back yet.

Cherries were a light crop; there were very few except Early Richmond; the buds of the others failed to come out well.

Many of the new apples are very disappointing. They have fine names, but are very deceiving when you get the fruit. It is too bad that they were ever placed on the market, and some of the varieties are hard to distinguish from the older varieties, such as Peter, which is very much like Wealthy, but said to keep longer. I have seen no difference yet; even the trees are also similar. Western Beauty is also much like Wealthy, but a little earlier. Yates' Red is too small for this section. Green Fameuse spotted badly, and is very unattractive, not keeping any better than the Fameuse; it is of nearly the same flavor. The Winter Fameuse is small, spots badly, and not so attractive as the Fameuse. The Boiken and Winter Banana are very fine winter apples, of excellent quality, and heavy bearers; will give satisfaction to those who grow them for their own use. Their color may be against them for the market, as they are the color of the old Maiden's Blush.

Sutton Beauty, Rome Beauty, York Imperial, Missouri Pippin, and Gano are, no doubt, going to make good winter apples for the commercial orchard; all are attractive red apples, good, early and abundant bearers, and will likely take well in the markets.

W. H DEMPSEY.

BURLINGTON FRUIT STATION.

Apart from apples the general fruit crop here was good. Prices also were fair, leaving a reasonable margin of profit. Owing to the frequent rains during the late spring and summer all sorts of bushes, vines and trees have made a strong growth. During the fall, however, a drouth set in which will tend to mature and harden the young wood, and thus prepare it for the winter.

The experimental fruit plantations are generally in a healthy, growing condition. A new plot of experimental blackberries was planted last spring. Apples were probably the lightest crop on record in this locality. The quality, too, was rather below the mark. The canker worm and tent caterpillar, as well as the codling moth, were in evidence. Spraying twice with a strong solution of Paris green thinned out the former. For the

tent caterpillar, crushing the nests when small by hand is, I think, the best remedy. Strict attention in the use of burlap bands, appears to be the most effective way of checking the codling moth or apple worm.

Of varieties, the Duchess for summer, the Ribston and Blenheim for fall, and the Baldwin Spy and Greening for winter, seem to take the commercial lead.

Southern Apples. Seven varieties of southern apple trees, one year old, were planted in a nursery row, viz.: Dyer, Collin's Red, Richardson Russett, Rengen Red, Olivet, Apple of Commerce, Black Ben Davis. Of 9 Collin's Red, 2 only are living. All the other varieties are living and have made good growth. Apple scions of 39 other varieties from the south, were top grafted into 4 Roxbury Russet trees, 23 years old. The scions reached here late in the season, but probably three-fourths of them took the sap and have grown very well. These are the varieties :—Belmont, Gilbert, Vandevere Pippin, Gill's Beauty, Carter's Blue, Little's Red Winter, Coffett Ingram, Monmouth Pippin, L. S. Pearmain, Cullesago, Red Belleflower, Pennsylvania Red Streak, Wandering Spy, Huntsman, Milam, Highfill, Rebel, Blue Pearmain, Kentucky Tolmstein, Houseley's Winesap, Payne's Gatekeeper, Wythe, Malinda, Ozark, Nickajack, Red Limberton, Bonum, Black Warrior, W. C. Limberton, Swaar, Minnesota Pippin, Kentucky Red Streak, Lou, Magnum Bonum, Keeper, Ramsdell's Sweet, Hatchet's Seedling, Yellow Horse.

Pears were a fair crop of good quality. There was less blight than there has been for several years. The Beurre Giffard, an early August pear, gave a heavy crop of fine fruit. The Wilder also an early pear, while not so productive as the Giffard probably leads in quality. Both of these varieties promise well.

The French pears planted in 1900 have all lived and made a good growth.

Plums were a very heavy crop. There was considerable rot however, especially on the Lombard, Reine Claude, H. R. P. Egg, and Yellow Egg. The Japan varieties were practically exempt from this trouble. Of the domestic plums grown here the Quackenbos was the most satisfactory, giving a heavy crop of saleable plums.

The Lombard, Yellow Egg, Bradshaw, Niagara, Imperial Gape, Reine Claude, Quackenbos, and Staunton, with the Japan varieties, Burbank and Abundance appear to be the leading commercial varieties here. Saunders and Moore's Arctic both promise well for early plums.

Peaches were a fair crop. The following experimental varieties planted here in 1897-98 bore some fruit this year : Champion, tree a strong, vigorous grower ; fruit, large to very large ; roundish-conical, of good quality, a cling-stone. Season, last of August, promises well.

Crosby, tree a vigorous grower, fruit medium, roundish-conical, yellowish red, of good quality.

Longhurst, a moderate grower, fruit medium size, oblong-oval, yellow flesh, skin yellowish-pink. A free stone of good quality. Season, middle of September.

Tyhurst. Tree a moderate grower ; fruit small, yellow flesh and skin, of good quality, a free stone.

The other varieties have not yet fruited.

Cherries were a good crop of excellent quality.

Grapes were a heavy crop. Some of the red varieties, such as the Delaware and Agawam, shed their leaves prematurely thus retarding their ripening. The Wilder (black) also defoliated early. The Eaton, a large black grape and a new variety here, does not seem to be productive. Massasoit, one of the Rogers early red grapes, is growthy and productive and promises well. It ripens with the Worden. The Moyer is a failure, too much wood and not enough fruit. Of the grapes grown here the Worden is probably the most satisfactory. It is growthy, hardy and very productive. There was practicably no mildew on any of the varieties, and they are going into winter in good condition.

Raspberries were a fair crop. Prices were exceptionally high, the first I sold bringing 20cts. per quart in Montreal. Of the red varieties Marlboro', Cuthbert, Loudon and Miller take the lead in the order named, while in black, Smith's Giant, Kansas and Older, stand at the head ; Columbia still ranks first in the purple, and Golden Queen in the yellow. Some of the tips of the Cuthbert canes were frozen last winter, but that is exceptional here.

A. W. Peart.

East Central Fruit Station.

In submitting my Annual Report for your approval, I have confined the varieties to those sent me by the Board of Control, as you desired, with the exception of plums and grapes. Those I have included in report, have all fruited one or two years, and some oftener, and are as nearly correct as I could make them, without giving a written description of each.

In Apples, the Western Beauty, which has fruited here for three seasons, is the most perfect specimen of any apple I have grown, although only a late fall variety. I will send you it. For a late winter, I have none that surpasses the Salome for bearing, good color, and keeping qualities ; besides it is a heavy and regular bearer.

In Pears, the Keiffers take the lead for bearing this season again, although Compte de Paris is about equal, and is superior in size, color and quality. There were several varieties sent me for trial which are of no use, being too small for commercial purposes and too shy bearers for profit. In compiling my notes on cultivation, growth, and profit, for the time the trees have been planted, I find the following varieties the most profitable for this year, viz. :

In Apples. 1st, Salome ; 2nd, Minkler and Boston Star being equal ; 3rd, Northern Spy ; 4th, Golden Russett.

In Pears, the first for yield was: 1st, Keiffer's Hybrid, and for age of tree Compte de Paris was a good equal ; 2nd, Clapp's Favorite, 3rd, Bartlett ; 4th, My New Seedling although B. Clairgeau, Lawrence, and Belle Lucrative yielded good crops.

In Plums, considering the age of trees, the palm must go to Burbank, but the largest yield was from Quackenbos, which yielded 23 and 27 12 quart baskets, respectively, from two trees Many other varieties did well. Very few plums were stung by curculio, but owing to damp weather some few rotted, but not to any great extent. I attribute to the spraying with Whale Oil Soap and Bordeaux Mixture, in a large measure, the cleanness of our fruit, as the last spraying was done after the fruit was well formed. and some of the plums were one third grown. We sprayed all our trees four times, the first being done as the buds began to swell.

For some reason, which I have not been able to discover, many of our apple trees did not have a blossom and consequently no fruit. This was not confined to any one or two varieties, as, for instance, one Baldwin had about three barrels of fruit, while seven others did not have a bushel ; the same applies to Spys, Russets, and others.

The growth of wood this year has been wonderful, and many of our oldest trees have made more wood growth than for many years past, the foliage of almost every tree has been a healthy, vigorous color during the entire season, and the wood and buds seem to be well ripened.

Taken altogether, our orchard appears to go into winter quarters in a good shape.

Most of our orchard ground was simply cultivated at intervals, while we grew about two acres of young orchard in root crop, after applying about twenty loads of barnyard manure per acre, which, I think, improved the young trees ; but after this year we propose simply cultivating the ground without a crop.

I sold my apples to a shipper for $3 00 per barrel to go to Winnipeg.

R. L Huggard.

Georgian Bay Fruit Station.

This season has been rather disappointing as to information on new varieties of plums. Although nearly the whole plantation produced a heavy and most beautiful bloom, only a comparatively few varieties bore heavy crops, and these were the self-fertile kinds, such as Lombard, Reine Claude, Tatge, Saratoga, and all the Gages, together with several varieties of Japan plums, such as Abundance, Burbank, Chabot, Hale's Japan, Orient, Red June, and Satsuma. All of these varieties bore abundant crops, some of them much too heavy. It will be remembered how wet and cold the weather was all through blossoming time, which no doubt prevented the wind and the bees from scattering the pollen. Even the curculio could not get in its work, and we had no harm done by it this season. This was also apparent in the apple orchard as only two or three kinds are bearing heavily, such as Greening, Russet, and Snow.

Where thorough and systematic spraying with Bordeaux mixture, together with good fertilization and cultivation, are carried on, the apple scab seems to be a thing of the past as we have had none for years. One could not find a basketful in fifty barrels, while in orchards near by, which are neither sprayed or cultivated, the fruit is almost worthless.

CHERRIES have done fairly well this season except a few trees that were slightly injured by the aphis, which no doubt lessened the quantity and quality of the fruit. We are beginning to find we can grow a good many of the better varieties of cherries almost as well as the common red. English Morello, May Duke, Montmorency, Windsor, Olivet, etc., even the thought-to-be-tender Yellow Spanish trees are quite promising; having been planted only three years they have already fruited twice.

GRAPES have done remarkably well, carrying immense loads through to maturity. We are now fruiting successfully here such varieties as Champion, Niagara, Salem, Delaware, Worden, Rogers' No. 4, Brighton, Moore's Diamond, Pocklington, Vergennes, Green Mountain, etc., wintered on the trellis.

Strange it may seem, but probably too good to last, this season has been a great surprise to us in peaches. Everything on the station grounds, that was old enough, bore a full crop, almost to breaking down, while in neighboring orchards, where trees were not so well headed in, they were actually broken to pieces. Young Fitzgeralds were a pretty sight to see, drooping to the ground with their load of large, high colored fruit. Triumph, Tyehurst and Bowslaugh have fruited now for the third season in succession, and seem to stand the winters as well as plums.

CULTIVATION. We have grown no grain or grass crops in our orchards for several years, and would about as soon think of doing without the orchard as growing farm crops in the bearing orchard. In order to conserve moisture we cultivate, or plow if necessary, in the spring as early as possible, work it down fine, and establish a coat of dust or soil mulch as it might be called. We keep it there till the middle of July or first of August; then cultivation should cease. We have followed this to good advantage by sowing red or crimson clover. It will take up the surplus moisture, and will tend to hasten the better coloring of the fruit, and also the more mature ripening of the wood.

JOHN G. MITCHELL.

GOOSEBERRY TESTING STATION.

I beg to submit the following report of my station for the year 1901:

PRUNING. All varieties of gooseberries gave the largest crop of the largest fruit I have ever had. In my opinion the larger berries were due to more severe and continuous pruning than usual. Last fall the bushes were cut away to six stems and the head thinned by one third. On the 15th of May all suckers except those needed for renewal were cut away, and the head again thinned by cutting away the new wood. This new wood was cut close to the stems as shortening induces the growth of much slim wood.

Fall pruning has just been completed for next year's crop, and consists in the cutting away of all branches from the six stems one third the way up the stem in addition to what was done last year. So trimmed, each stem has the appearance of a little tree.

Red Jacket, Pearl, etc., were noticeably larger, while Champion, not spring pruned, was no larger than usual.

SPRAYING. Two sprayings were given before the leaves came out, with bluestone water, two pounds to 25 gallons of water. Liver of sulphur was used for the remainder of the season. At first sprayings were made every eight days and after every heavy shower. Mildew made its appearance, just little specks upon the berries, on the 6th of June, and by the 14th half the fruit was covered. Spraying was continued, care being taken to wet every part of the bush. The result was that the disease went no further after the 14th and the berries were injured apparently only in appearance. Mildew generally makes its appearance upon the young, tender leaves and shoots of the plant; this year neither have been affected by the disease. Our first spraying with bluestone will be made this fall.

FERTILIZERS USED. A good dressing of stable (horse) manure was given in 1899 followed in 1900 by ashes. This season the bushes were mulched with about half an inch of good hard wood ashes. This fall stable manure will be dug in between the rows.

CULTIVATION has been scuffling between rows, and between and working under the bushes very shallow by hand with a good sharp, long handled shovel.

FRUIT FALLING In the earlier part of July the fruit of most of the American varieties commenced falling badly as usual, but not so badly as last year. I at first attributed this falling to an egg being deposited by a fly or a moth, but after careful observation I am satisfied it is caused largely by lack of moisture in the soil

PLUMS. Japan plums, set three years, not a twig killed so far; Wickson, very vigorous, all gave a few plums, large, good; Abundance and Burbank, both vigorous fruit, larger than Lombard; Willard, very vigorous, fruit large and showy, earliest of all, valuable here. Lombard, 12 years from graft, grafted just above the ground from the old Green Gage, sprayed with Bordeaux, did not lose a plum. At least half the Lombards in this section rotted. Japan did not rot even where not sprayed. Yield 13 full 12 quart baskets at 50 cents per basket.

STRAWBERRIES.	Williams, two rows 200 feet long, yield			....	450 qts.	at	$7\frac{1}{2}$c.
	Sadie,	"	"	" too small..	100	"	$7\frac{1}{2}$c.
	Clyde,	"	"	"	50	"	$7\frac{1}{2}$c.
	Glen Mary,	"	"	"	50	"	$7\frac{1}{2}$c.
	Edgar Queen,	"	"	"	40	"	$7\frac{1}{2}$c.
	Saunders,	"	"	"	35	"	$7\frac{1}{2}$c.

Clyde burned up after first picking.

New strawberry beds—Plants $1\frac{1}{2}$ feet across, solid wall each side runners; have been cut five times; have added William Belt, Haverland, Van Deman, Nick Ohmer, Michael's Early, Green's Big Berry, Woolverton, Gandy, and Splendid. All are carefully labelled.

RASPBERRIES. Columbian gave half a crop, but made a splendid growth of canes, 2 qts. to hill at $8\frac{1}{3}$ cts, \$2.00 for 24 qt. crate.

Shaffer gave not half a crop, made fine canes, $1\frac{1}{2}$ qts. to hill at $8\frac{1}{3}$ cts. Best berry for home use and market, too, if people learn to know them.

CHERRIES —1 doz Dyehouse 3 years planted gave a nice little crop of beautiful fruit. This tree must be either a cross of Ostheim or some variety of the kind, I judge, from the peculiar marking of the bark.

50 Ben Davis and Pewaukee apples set 2 years ago have made almost phenomenal growth.

PEARS Clapps Favorite set 10 years gave a dozen large beautiful pears. Flemish Beauty, set at the same time, no fruit yet. Keiffer 3 years set gave 1 dozen each, but they are yet as hard as a rock. Clairgeau 3 years set makes very little growth.

S. SPILLETT.

LAKE HURON FRUIT STATION.

I am pleased to report that the work carried on at this station during the past season has given satisfactory results. Very little planting was done. Last spring only one variety of plums were sent to this station, but the manager of his own accord planted four varieties of peaches, three varieties of pears, and three of currants Another plantation of raspberries was set out of nearly all the former varieties at first planted. The manager of this station has every reason to be thankful for this season's crop, for on the whole it has been a good one. The yield of apples was not quite as heavy as two years ago but heavier than last year, and of much better quality, especially the Spys, which were very fine. Some of the newer varieties of apples commenced to bear, and nearly all the varieties of plums fruited, also most of the cherries. All of those varieties that gave sufficient fruit for picking will be mentioned in the notes. The winter of 1900 and 1901 was a very mild one, the lowest degree of frost being 13 below zero, and that occurred on the 13th of December. All the plants and trees came through in first class condition with the exception of the Cuthbert raspberry, which was damaged to some extent owing to a late growth in the fall, and the early frost in December.

Notes :—May 1st. Sprayed plums with Bordeaux.

" 10, 11 and 13th. Sprayed apples.

" 12th. Had cold rains with snow.

" 24th. Heavy rains all day turning colder in afternoon, temperature at 7 p. m. 36 degrees.

During the latter part of May the green and black aphis appeared in great numbers.

June 1st. Sprayed peach, plum, and apples for green aphis, cherry for black aphis, and rose-bush for thrip, with Mystic Spraying Compound; this mixture is a tobacco preparation, and it was most useful in cleaning the trees of all that classes of insects. *Codling Moth* was rather more numerous than usual. *Fungi* in its various forms was conspicuous by its absence this season, very little of any form being noticed.

A. E. SHERRINGTON.

MAPLEHURST FRUIT FARM.

The cherry harvest is becoming much more important than it was a few years ago, when cherry trees were planted only in waste corners. Now a good many are planting acres of single varieties and making a business of wholesale shipments. The black aphis is a most troublesome insect enemy of the cherry trees, not only checking the growth, but also disfiguring the fruit and preventing it from ripening. It must, therefore, be vigorously fought on its very first appearance by a thorough spraying with kerosene emulsion, or with kerosene and water mixture, for which some pumps are now adapted. It is much easier of application than the emulsion and more economical. Some say that five per cent. of kerosene is strong enough for the aphis, but so far we have not satisfied ourselves on this point.

The best package for the cherry, in our Canadian markets, is scarcely a settled question. We have been using two sized baskets at Maplehurst, one holding about twelve Winchester quarts, and the other six, and for choice cherries we have found the small size the best. These are covered with a wood and leno combination cover, showing the fruit to purchaser without its removal. We do not face the package with any finer fruit than is found throughout, but we lay the top layer so as to hide the stems, which makes them much more attractive in appearance. We never think of shipping our cherries as they come from the trees, because they are mixed with leaves, poor cherries, etc We bring them to a packing table, pour them out and repack so that our purchasers will get only first-class fruit.

The picking is usually done by men, especially in our old orchard where the trees are high and long ladders are needed. In the younger orchards, however, where the trees are smaller and can be reached by step ladders, we often employ women and girls, and find them excellent pickers.

In the packing house we employ women, for it is a work they enjoy, and they do it with excellent taste.

In the large cities we see the California cherries offered for sale in shallow boxes, holding about two layers, the top beautifully placed in regular rows, without a stem to be seen. Our engraving (from the Fruit Trade Journal,) shows a cherry packing house at San Jose, California, where the fruit is being put in these boxes. (See page 5.)

The size of these boxes is, outside measurements, 18 inches in length, $10\frac{7}{8}$ inches in width, 3 inches in depth. Inside measurement, length $16\frac{1}{2}$ inches, width $10\frac{3}{8}$ inches, depth $2\frac{1}{2}$ inches. The capacity is 10lbs. of cherries.

It is an open question whether it would not be an advantage for us to adopt this package for our choice cherries.

Refrigerator cars have proved of great service to our fruit growers, enabling them not only to reach cold storage steamers with fruit for export, but also to reach the home markets with tender fruits in far better condition and at less cost than by express. The immense quantities sent forward from the Niagara district, for example, at one time so congested the service of the express trains that the goods were handled most carelessly. Now we can load a refrigerator car at leisure and forward by fast freight to such a centre as Ottawa or Montreal, and have confidence in the safe arrival even after a journey of forty-eight hours.

A great mistake is often made by over-loading such cars. The hot air is driven to the top, so that there should be a space over the goods of about two feet, and besides this, there should be a space of $1\frac{1}{2}$ or 2 inches between the packages for the free circulation of the cold air. For want of attention to such provisions many large shipments have arrived in bad condition, and the car blamed for what was really the fault of the shipper.

THE BORDEAUX MIXTURE. Early treatment with this remedy for fungi of all kinds should be faithfully persevered in, if the best results are to be obtained, always remembering that it is a prevention rather than a cure

The lime and copper sulphate solution should be made separately, with about half the amount of water required for each. Then the copper sulphate solution should be poured into the lime water, stirring vigorously all the time; never reverse this operation.

L. WOOLVERTON.

ST. LAWRENCE FRUIT STATION.

The winter of 1901 proved severe on some varieties of fruit trees and buds. There was a good covering of snow from Nov. 23rd to the last week in March, and in the orchards where there was a cover crop the ground was not frozen. The injury seemed to be the result of a late growth of wood and buds not fully ripened. The temperature during the winter months was normal and steady.

The first eight days of May were moderately warm, with frequent showers, which brought most fruit trees into bloom. From that date to June 10th it rained nearly constantly, making the ground so wet that grain seeding and general farm work was at a standstill, and spraying was done under great difficulties. The blossom was poorly fertilized and the young fruits drooped badly, making it one of the lightest crops we have had in years.

Where four sprayings were made fruit was 75 per cent. clean, but throughout this section spraying was generally neglected, and fruit proved worthless in such cases.

All fruit trees in the experimental orchard have made a good growth of wood and have developed fruit buds in many cases.

The cover crops of red clover are thick and heavy, and will afford ample protection to the roots during the coming winter.

Field mice are so numerous and the cover crop so heavy that I am protecting all young trees with tar paper as a precaution against injury.

HAROLD JONES.

SIMCOE FRUIT STATION.

This season has been, on the whole, one of the most favorable for most varieties of fruit that we have had for several years, although the apple crop was much below the average. Other fruit (with the one exception of raspberries, which were injured by winter killing and again by the extreme heat of July at time of fruiting) were a good crop. The winter of 1900–1 was the mildest for several years, 20 below zero being the coldest dip we had. The fruit buds came through in good shape, and there was a great profusion of bloom on all fruit trees. The partial failure of the apple crop was no doubt due to a cold east rain that prevailed for two days just at the time the blossoms on most of the trees were about to shed their pollen. This cold rain washed off the pollen and prevented the bees from working. Much of the fruit that did set seemed to lack vitality and dropped early, soon after forming. In my own orchard the Spys and Ben Davis, which bloom later, set and matured a good crop. The plums and cherries bloomed early and in fine sunny weather, and were a fine crop and of best quality. Strawberries were good, though shortened to some extent toward the last by dry, hot weather. Raspberries were the nearest to a total failure in my experience. They were simply cooked and dried up by the fierce heat of July. Rain came in time to save the blackberry crop, and the fruit was very fine. Most of the young cherry trees were well loaded, and the fruit was the best in quality I think I have ever seen. The same may be said of the Japan plums. Five trees of Burbank, four years planted, yielded thirty-six baskets and the plums were of fine quality.

None of the experimental stock has failed this year, except one or two of the French pears. Everything receives clean cultivation, is properly pruned and sprayed, and presents a healthy, vigorous appearance.

RASPBERRIES Cuthbert, the best red variety in point of quality of all the varieties tested here, is not a profitable commercial berry. There is too much loss of bearing wood by winter killing, especially after a fine open autumn. They continue to grow so late

the wood is not sufficiently ripened, and they kill back nearly to the snow line. Loudon and Miller seem to be hardier, but do not sucker freely, and are slow in propagation. Golden Queen is a poor market berry, as it goes off in appearance very quickly after picking. The hot, dry weather of July played havoc with the raspberry crop this year.

STRAWBERRIES The best all round strawberry I have tested here in the last five years is the Williams. It is a healthy and vigorous plant, stands the drouth well and carries its size well through the season. Its chief fault is its white tip. The old Crescent is still the greatest yielder. Clyde is a large, healthy plant, and the fruit is large but pale in color, and there is not much left after the second picking if the weather is dry. The advent of the perfect strawberry is still in the dim and distant future.

BLACKBERRIES. After a trial of thirteen varieties there are two that I have no hesitation in recommending for this section of country. They are the Agawam and Eldorado. These are both hardy and healthy and bear a fine crop every year. The Eldorado is not so productive as the Agawam nor does not sucker as freely, but the fruit is larger and a little better in quality. These two have given excellent satisfaction and I am greatly pleased with their quality

Nursery agents have been selling blackberry plants through this section for several years, and recommending varieties that they knew nothing about, with the result that people were about discouraged with trying to grow blackberries at all. They would make a fine growth of canes during summer, but in spring they would be dead down to the snow line, and they were minus the bearing wood, and of course could produce no fruit; but these two varieties may be planted with every assurance of success.

Some people reading this report may say, "What about the Snyder, it is a hardy variety." Yes it is, and I used to grow it, but I don't now. I wanted something hardy enough for this section and of a good deal better quality, and I have got it.

G. C. CASTON.

SOUTH-WESTERN FRUIT STATION.

PEACHES were about an average crop. The quality, however, was not quite up to the usual standard in most varieties. This was the result of the very dry weather which prevailed during the whole of the ripening period, together with the injury caused by the severe frost of February, 1898. Here and there trees still continue to die from the injury received at that time.

The trees came through the past winter in good condition, very few blossom buds injured. The spring was cold and backward which is usually conducive to "Curl leaf;" the injury from that cause was not great, however.

The experience of another season goes to show the growing importance of selecting the best varieties for orchard planting. We must study the requirements of the people, and try to put on the market the class of fruit wanted. But very few white-fleshed peaches are required at the present time for market purposes. They are in some demand for home use, but about nine out of every ten prefer yellow sorts. At our own table we are learning to think more and more of the white-fleshed kinds. When planting for commercial purposes it is very important to select the best varieties that will ripen in succession to cover the whole season. Dealers want fruit every day. If you cannot supply them, they will look elsewhere for their supplies.

Too many of the Alexander or early clingstone class have been planted. They injure the sale of good fruit when first offered, as consumers are afraid of getting clingstones and do not buy readily for some time after the good freestone sorts are on sale.

The following varieties are named in their order of ripening and contain the cream of the list that have been tested at this station: Triumph, St. John, Garfield, Early Crawford, Fitzgerald, Yellow Rareripe, Engle Mammoth, New Prolific, Elberta, Bronson, Crosby, Golden Drop, Smock, Salway. The latter will not ripen except in favorable localities. These sorts will give a succession from the first ripening good variety to the last, and cover the whole of that period without interruption.

JAPAN PLUMS are receiving a good deal of attention at the present time. They no doubt hold a very important position among our fruits. They are not of as good a quality as the European varieties, therefore will not displace them. They are very rapid

in growth, bear young and abundantly, and several of them ripen just enough in advance of the European sorts to make them valuable for market purposes. Of those fruiting at this station I have been most favorably impressed with Red June, Abundance, Burbank and Satsuma. The latter is a blood plum, and the best for canning purposes of any of the Japan type; we prefer it to most of the European varieties. Red June, Abundance and Burbank ripen before most of the European sorts, on this account and their productive habits will be profitable to plant for market.

Wickson is the largest of the type, and its handsome appearance will make it valuable for market, should it prove vigorous and productive on a more extended trial. This season the ends of the branches blighted badly on many of the trees.

Berckmans is very much like Burbank in appearance, but not of as good quality and ripens later.

Chabot resembles Abundance, not of as good quality and ripens later.

Hale is of large size, good quality and fine appearance, but unproductive on trees five years planted.

Ogon is of such poor quality that it is not desirable.

I hope to be able to give a more extended report on Japan plums next season.

W. W. Hilborn.

APPLES.

Notes by W. H. Dempsey. (*Bay of Quinte Station.*)

Whinnery. Top grafted 1893; very slow grower; wood small, inclined to droop; foliage medium; fruit $2\frac{1}{4}$x$2\frac{3}{4}$, roundish, conical, skin greenish yellow, nearly covered with crimson; numerous large, gray dots; calyx nearly closed, set in a broad, moderately deep basin; stem $\frac{3}{4}$ inch, slender, set in a medium cavity; flesh white, firm, not very juicy; mildly sub-acid, good. Season, February to April.

Acher. (Illinois seedling.) Top grafted 1894; strong grower, heavy wood; foliage, large, heavy, good; fruit, 2x$2\frac{3}{4}$ inches, regularly formed; roundish, oblate; skin smooth, yellow streaked and splashed with red; calyx large, nearly closed, set in a wide, uneven basin; stem $\frac{3}{4}$ inch, set in a moderately deep cavity; flesh white, sub-acid, not so juicy as the Duchess, which it resembles very closely, but it will not keep as long. August-September.

Gravel Pippin. Top grafted 1894, medium grower, foliage medium; fruit 3 x $2\frac{1}{4}$ inches, round, conical; skin golden yellow, nearly covered with light red, with splashes and streaks of a darker red and numerous small gray dots; calyx open, set in a broad, even basin; stem $\frac{5}{8}$ inch long, slender, set in a narrow, deep, greenish cavity; flesh white, fine grained, mild, pleasant, sub-acid, core small. January-March.

Green Fameuse. Top grafted in 1894, made good growths, foliage medium; fruit $2\frac{1}{2}$x$2\frac{1}{4}$ inches, roundish, conical; skin yellowish white, with a few green dots; calyx nearly closed, set in a narrow, furrowed basin; stem $1\frac{1}{4}$ inches long, slender, set in a deeply-inserted cavity; flesh white, very tender, juicy, similar to Fameuse. October-November.

Yates' Red. Trees planted in 1897; a very good grower; fruited two years; foliage good; fruit 2x$1\frac{3}{4}$ inches, roundish, conical; skin greenish yellow, nearly covered with dark red, with numerous small gray dots; calyx closed, set in a broad, uneven basin; stem $\frac{3}{4}$ inch, slender, set in a russet cavity; core large; flesh, greenish white, fine grained, crisp, sub-acid. March-May.

Isabella. (Seedling of S. C. Willson, Whitby.) Top grafted in 1895, vigorous grower, heavy foliage; fruit 3x$3\frac{1}{4}$ inches, roundish, oblong, much narrower near the calyx; skin lemon yellow, with crimson next the sun, with numerous dots; calyx partly closed, set in an uneven basin; stem $\frac{3}{4}$ inch, medium, set in a broad, green cavity; flesh white, tender, juicy, mild, sub-acid; core large; season, October-November.

NOTES BY R. L. HUGGARD. (*East Central Fruit Station*)

America. Quality, medium; fruit, round, red, and firm. December and January.

Belle of Boskoop. Hardy; fruit, large, round grain with russet dots and splashes; quality, equal to R. I. Greening; flesh, solid, yellowish white, good flavor. January-April.

Bethel. Growth, 22 inches; fruit, medium to large, dull color, fair quality, coarse flesh, medium bearer. January.

Ben Davis. Fruit, medium to large, beautifully colored, very solid flesh and a long keeper; quality, poor.

Bismarck. Fruit, large, nearly round, very handsome; flesh, a little coarse grained; good quality. January and February.

Cayuga Red Streak. Fruit, very large, nearly globular; flesh, coarse; good flavor; skin, green, smooth, half-covered with red splashes; productive; rather tender. November and December.

Clayton. Tree and fruit resembling R. I. Greening but more upright habit; hardy and productive. January-March.

Cranberry Pippin. Vigorous; growth, 20 inches; fruit, large, smooth, mostly covered with red, somewhat flattened; yellow flesh; quality, good; productive and hardy; a good shipper. January-April.

Duchess of Oldenburg. One of the hardiest and best of our fall apples. September and October.

Gano Fruit, medium to large, inclining to oblong; skin, yellow with blush on sunny side; flesh, white: quality, fair. November and December.

Longfield. Very straggling grower, hardy and productive, requires thinning, smooth skin, yellow with a bright blush; fruit, medium, oblong; flesh, white and juicy. December

La Rue. An early and prolific bearer of large dark red fruit; nearly round; skin, smooth, heavily dotted with areole spots; quality better than Baldwins; solid flesh and good shipper. January-April.

Lacey. A small handsome apple of excellent quality for export.

Mann. Hardy; fruit, smooth, green, nearly covered with whitish dots, medium to large size; good quality. January-May.

McIntosh. Fruit, large beautiful red; skin, smooth; quality, good; flesh, white and juicy. January.

Ontario. Four years planted, 33 fruits, growth 23 inches; fruit, medium to large, flattened, yellow and red; quality, excellent; rather a slow grower but healthy and an early and abundant bearer; will pay for high cultivation.

Peter Hardy; not yet fruited; a rapid grower.

Red Bietigheimer. Very vigorous; 32 inches this season; 4 years planted; 9 fruits of the largest size; skin, smooth, flesh-coloured; flesh, fine-grained, white and juicy; ripe October 5th. Season, October and November.

Red Canada Four years planted; yield, 12 quarts; tree vigorous; growth, 21 inches; fruit, medium to large; skin, covered with dark red and numerous brown dots; flesh, very firm; medium bearer and quite hardy; a good shipper. January-March.

Salome. Rather slow grower; fruit, medium to large; of a beautiful yellow skin, mostly covered with carmine; skin, smooth and glossy; flesh, solid and white; good quality and productive.

Sutton's Beauty. Slow upright grower, 17 inches this season; rather delicate; not yet fruited here.

Stark. Growth 36 inches; the most vigorous of any tree in the orchard; fruit medium to large, mostly covered with red; a good shipper; quality, very good. January-April.

Scott's Winter. Rather slow grower; four years planted; growth, 17 inches this season; fruit, medium, slightly russeted, good flavor. February and March.

Tetofsky. Four years planted; bore a few samples; rather slow grower; hardy; fruit, large, yellowish green, rather acid till fully ripe. September.

Russian Transparent. Fruit, very large, light golden yellow; skin, smooth; the best early variety. July and August.

Russian No. 277. A regular grower of large fruit; skin, dark green turning yellow at maturity, red cheek on sunny side; fruit, inclined to oblong; flesh a little coarse; flavor, good. October and November.

Russian 230. A rapid grower, three years planted, nine inches growth; upright stalk; large dark foliage; fruit, resembling Duchess of Oldenburg, but three to four weeks later.

Russian 161. Fruit, medium, roundish yellow with red cheek; skin, smooth; flesh, white and juicy; an abundant bearer; hardy. November and December.

Wealthy. A beautiful apple; hardy and vigorous; an abundant bearer; fruit, medium to large; smooth skin; flesh, white, often veined with red. October and November.

Walbridge. Fruit, round; skin, smooth and green, half covered with red splashes; medium size; fair quality. December and January.

White Winter Greening. Medium sized fruit; smooth green skin; flesh, white, of fair quality. February and March.

Wolf River. Four years planted, 15 samples; fruit, medium to large, flattened, yellow with a red blush; flesh, white, firm and good. December and January.

Wellington. Fruit, medium, round; mostly covered with red; flesh, coarse, sprightly. December and January.

York Imperial Fruit, large, dark red; thick skin; flesh, white, moderately juicy, firm, good.

Yellow Newtown Pippin. A slow spreading grower; medium foliage, not yet fruited.

These are mostly the new varieties that fruited this season.

All our trees were sprayed four times and some five times, with the result that we had very few stung or wormy fruit, and no spots or scales on any except Fall Pippins which were only sprayed twice, and many of them had spots on them. The Codling Moth was very much in evidence early in the season, but seemed to get other fields of operations later on. Our trees all look ready for winter before much frost came, and the fruit buds seem well developed.

Fruit of all kinds sold well this season, so the growers got fair returns in this vicinity.

Notes by A. E. Sherrington. (*Lake Huron Fruit Station*)

Apples. Notes on a few of the new varieties that have commenced to fruit.

Bismark. This is a very handsome apple in appearance; fairly vigorous and apparently hardy; fruit, large conical; color, nearly covered with red, smooth and clean; has a very fine appearance; bloomed May 20th, four years old.

Barry. A very good grower, seems hardy; fruit, rather small; ribbed color yellow; not very promising; bloomed May 20th, four years old.

Peter. Tree rather peculiar in its growth, the limbs on the west side of tree trying their utmost to get on to the east side of tree; fruit, medium to large; color, nearly all red; resembles Wealthy; bloomed May 28th, four years old.

Gano. A very good grower, hardy; fruit, small to medium; color, red; resembles Ben Davis; bloomed May 20th.

Wine Sap. Tree spreading, hardy, vigorous; fruit, small; color, red; quality, good; bloomed May 20th, four years old.

Yellow Transparent. Tree, fine, upright grower; foliage, large, healthy and hardy; fruit, large; color, waxy yellow and quality very good; bloomed May 18th, four years old.

Pears. As none of the young trees have fruited yet, I am unable to give much of a report; a few more varieties were added this season. The *French Pears* received a year ago, are doing well, also all other varieties.

Notes by Harold Jones. (*St Lawrence Fruit Station*)

The experimental apple orchard was manured with barnyard manure and planted to corn for husking, leaving a space round each tree of 6 to 7 feet.

All the trees came through the winter in fair to good condition, and have made a strong, healthy growth during the season. The only new variety planted this spring was Wismer's Dessert. The following varieties are top worked and growing well: Mammoth Black Twig, Wine Sap, King, Cox's Orange Pippin, and the true Canada Red, as supplied me from Quebec through Prof. Waugh, of Burlington, Vt., which differs from the Canada Red that is grown here.

Some of the varieties planted in 1896 have borne a few specimens this year.

Chenango Strawberry. Fruited this year for the first time. The tree makes a slow, feeble growth with a close round to spreading head; small, light green, thin foliage. The fruit is of medium size, oblong, conical; color, light yellow streaked with bright red; flesh, tender breaking, mild, sub-acid, good, free from spot. Season, September-October. Not likely to prove of value in this section.

Longfield. Has fruited for the third time. Tree a moderately vigorous grower of drooping habit; foliage healthy, light green with grayish cast; a heavy and early bearer; fruit, small to medium, conical; skin, yellowish with pale blush on sunny side; flesh, white, tender breaking, juicy, mild, sub-acid, pleasant. Season, October-November. Not a good apple for shipping and hard to handle for home market.

Ontario. Has fruited for the second time. Tree a medium grower, making a compact spreading head; foliage, healthy and abundant; fruit 3x2 inches, oblate; skin, greenish yellow shaded with dull read; flesh, white, tender, acid. Season, December-February. Gives promise of being valuable as a shipper and market variety. Some young trees, one year old, showed injury by sunscald last spring; a few more seasons will be required to prove whether it is perfectly hardy or not.

Milwaukee. Fruited for the second time this year. The tree makes a very vigorous spreading growth, and is very healthy and hardy; foliage, large, dark green and abundant; fruit, $3\frac{1}{2}$x$2\frac{1}{2}$ inches, oblate; calyx partly closed, set in a rather deep, broad basin; stem, slender, in a deep, broad cavity; skin, yellow splashed with bright red; flesh, a little coarse, crisp breaking, juicy, acid. Kept well last year through February. This variety gives promise of being a valuable mid-winter apple and a good shipper. Desirable.

Shackelford. Fruited for the first time. Tree, a slender speading grower; foliage, small, light green; fruit, $2\frac{1}{4}$x$1\frac{3}{4}$, roundish; caylx, closed in a shallow, broad basin; stem, slender in a shallow cavity; skin, greenish yellow, splashed with pale red, smooth, almost greasy; flesh, greenish white, tender, crisp, juicy, mild, sub-acid, good.

So far as we know at present the most profitable apples to grow in this section for the different seasons are as follows:

Summer and Early Fall. Yellow Transparent, Red Astrachan, Duchess, Brockville Beauty, Alexander.

Fall and Early Winter. Fameuse, McIntosh Red, Scarlet Pippin, Wealthy.

Mid-Winter and Late Winter. Golden Russet, Scott's Winter, Talman Sweet.

Promising.—Ontario, Milwaukee.

NOTES BY G. C. CASTON. (*Simcoe Fruit Station.*)

RUSSIAN APPLES. Some new varieties have fruited this year.

Bode. A Russian apple from the Experimental Farm, Ottawa; is best dessert apple yet tested among the Russian varieties; tree, upright, vigorous, healthy; fruit above medium size, conical; skin, green streaked with red; flesh, white tinged with red, tender, juicy with an agreeable flavor. Season early September.

Karabouka. A Russian, is a *fac simile* of Yellow Transparent; same season; a little smaller in size.

Lubsk Queen. A handsome Russian apple of medium size; round and smooth, with yellow skin and a bright red cheek like Maiden's Blush, but covered with a delicate bloom; it is a good cooker but with no pronounced flavor; season August; tree, healthy and vigorous, an upright grower.

Romanskoe. A large Russian apple somewhat resembles the Colvert but larger; a good cooker but has no dessert quality; tree bears young and is a strong, healthy, vigorous grower. This is a handsome apple, and would no doubt be valuable for northern districts; season, September.

Bogdanoff. This is the longest keeper of the Russians fruited up to date ; it is at this writing November 9th, quite firm and solid ; tree healthy, strong, upright grower ; fruit, large, flattened and somewhat ribbed ; skin, greenish yellow overspread and splashed with dull red ; calyx closed in broad deep plaited basin ; stalk, short and slim, set in a shallow insected cavity ; flesh, yellow with no pronounced flavor.

I doubt if we will find among the Russian apples anything that will at all compare in quality with the best of our old and valuable commercial varieties However they have two qualities to their credit ; they are mostly hardy and may prove valuable for northern districts where other varieties could not be grown, and they make splendid stock for top grafting our best commercial apples on.

OTHER VARIETIES :

Boiken. Sent by Stone and Wellington in 1896. Tree resembles Golden Russet, best began to bear two years after planting ; this year was loaded with fruit. A handsome apple above medium size with yellow skin and a bright red cheek ; flesh, white, a splendid cooker, would probably keep well until February. This apple from its bright, clean and handsome appearance, good cooking qualities and early abundant bearing, is likely to prove a good one and well worthy a place in the commercial list.

Gano. I am inclined to believe that in this apple we have one that is going to prove of great value ; the tree resembles Ben Davis so closely that it would be hard to distinguish them apart ; the same habit of growth ; the same abundance of small twig like branches, requiring a frequent use of the pruning shears ; an early bearer. These have borne two years after planting and every year since ; planted in 95, two of these trees yielded a barrel of apples this year. It will keep as long as Ben Davis, and I believe will to a great extent supplant that variety. It is a much better apple as to quality, handsome appearance, a deep dark red when matured ; above medium size, clean skinned and free from blemishes. It ought to be a valuable sort for the British market.

Winter St. Lawrence. This is no improvement on the Fall St. Lawrence, and I doubt if it would keep a month longer.

Downing's Winter Maiden's Blush. This resembles the fall variety of that name but keeps a longer and is larger in size.

Barry. A yellow apple above medium size. I see nothing about it to recommend it so far. With respect to new varieties of apples, we must be very careful about recommending them. Nothing should be added to our commercial list, unless it has very high merit to commend it The complaint is justly made that we are growing far too many varieties now. This fact is doing us injury in the British market.

TOP GRAFTING. I feel that I cannot too strongly advise the top working of our best commercial apples on hardy free-growing healthy stock, as the best practice for this section of country, and taking the scions from the best bearing trees. Had this plan been adopted twenty years ago it would have added many thousands of dollars to the returns from our orchards. The question is often asked in this connection—What is the best stock to use for that purpose? There is nothing better than Talman Sweet. It is hardy, a free grower does not split easily when loaded with fruit, and unites well with any variety grafted on it. I have also experimented with several other kinds of stock, and have had good success, with grafting Spy, Ontario Baldwin, King and Greening on the following stocks, Haas, Longfield, Wallbridge, Bell, De Boskoop, Yellow Transparent, Blushed Colville, Anisim, Alexander. Such slow growing varieties as Duchess and Wealthy which overload with fruit, and though hardy and healthy make too slow growth of wood, are not good stocks for that purpose. The same may be said of many of the crabs, though I have found some of them do very well. My experience proves that in every case where our best apples are top worked on good healthy suitable stock, the fruit is of superior quality. We get earlier bearing, greater yields, more regular crops, and as Col. Sellers says in "The Gilded Age," "*There's millions in it.*"

BLACKBERRIES.

NOTES BY A. W. PEART. (*Burlington Station.*)

Blackberries were a good crop Owing to the cold wet weather in May, blooming as well as ripening was delayed from a week to ten days beyond the normal period. Prices were satisfactory, ranging from 7 to 12 cents a quart according to size and quality. The best commercial varieties so far tested are :—Agawam, Erie, Gainor, Kittatinny, Ohmer, Snyder, Stone's Hardy, Taylor, Western Triumph. Of the early varieties, Early King and Early Harvest, have done the best, although both are somewhat tender.

Agawam. Plant upright spreading hardy, vigorous and productive ; berry, oblong, round, medium size, sweet but rather insipid. Season, medium, to late, one of the best.

Ancient Briton. Plant, upright, spreading, hardy, medium, vigorous but not productive ; berry, oblong, conical, medium size, good flavor. Season, medium.

Child's Tree. Plant, upright, spreading, hardy, moderately vigorous, not very productive ; berry, ovate, round, small to medium, flesh, firm, sweet and sprightly in flavor. Season, medium.

Dorchester. Plant, upright, spreading, very vigorous, hardy, but only a moderate bearer ; berry, large, oblong, round, firm, sweet and sprightly in flavor. Season, medium.

Early Cluster. Plant, upright, moderately vigorous, tender and unproductive ; berry, medium size, oblong, round, good in quality. Season, medium to late.

Early Harvest Plant, upright, medium vigor, tender, but very productive ; berry, medium, to large, oblong, conical, fair in flavor. Season, early.

Early King. Plant, upright, spreading, medium vigor, tender but productive ; berry small to medium, oblong, round, of good quality Season, early to medium.

Eldorado. Plant, upright, spreading, vigorous, hardy, and moderately productive ; berry, oblong, conical, medium, to large, sprightly, good in flavor. Season, medium.

Erie. Plant, upright, spreading, vigorous, hardy and productive ; berry, medium size, conical, round, excellent in quality. Season, medium. A good commercial variety.

Gainor. Plant, upright, vigorous, hardy and productive ; berry, very large, roundish, oblong, fine in quality Season, medium. A promising commercial variety.

Kittatinny. Plant, upright, very strong and vigorous. Productive and hardy here thus far ; berry, moderately firm, large to very large, ovate, conical, rich, juicy and sweet. Season, late. A fine commercial blackberry.

Lovett's Best. Plant, upright, stiff, moderately vigorous, hardy but not productive ; berry, oblong, round, small, of fair quality. Season, late.

Maxwell. Plant, very weak and spreading, tender and not productive ; berry, oblong, round, large to very large, quality, excellent. Season, medium. Too weak for commercial purposes.

Minnewaski. Plant, upright, spreading, vigorous, but tender and unproductive ; berry, medium to large, oblong, round, of good quality. Season, medium.

Ohmer. Plant, upright, spreading, moderately vigorous, hardy and fairly productive ; berry, very large, oblong, conical, good quality Season, medium.

Snyder. Plant, upright, medium vigor, hardy and very productive ; berry, medium, oblong, oval, fair quality Season, early to medium. One of the best market varieties. with a rich soil, and damp subsoil. This berry like the Western Triumph, will give very heavy crops of fruit.

Stone's Hardy. Plant, upright, spreading, moderately vigorous, hardy and productive ; berry, medium, oblong, conical of fine quality. Season, medium. This variety is very promising.

Taylor. Plant, upright, vigorous, hardy and moderately productive ; berry, medium, oblong, conical. Season, medium. A valuable commercial berry.

Wachusetts. Plant, upright, vigorous, hardy but not productive ; very, few thorns ; berry, medium, oblong, round, sweet, of excellent quality. Season, medium, to late.

Western Triumph. Plant, upright, very strong and vigorous, hardy and very productive ; very thorny ; berry, medium, oblong, round, of good quality. Season, medium. A good market variety, but requires a rich damp soil.

Wilson's Early. Plant, rather weak, hardy but not very productive ; berry, large, oblong, round, good quality. Season, medium.

Wilson Junior. Plant, spreading, vinous, trailing on the ground. Propagates by both tips and suckers. Hardy but not productive. Fruit, medium, oblong, conical, sweet. Season, medium.

CHERRIES.

NOTES BY L WOOLVERTON. (*Maplehurst Fruit Station.*)

The past season has been a most peculiar one, with most disastrous results. Nearly the whole of May was characterized by an almost constant raintall ; as a consequence the pollen of the cherry bloom was not only weakened, but largely washed out, and, while the bloom appeared abundant enough, and much of it seemed to be setting, it was gradually evident that the young fruit was not well fertilized and that very little of it would grow and mature. During the month of June this daily grew more evident, and another evil also resulted from the excess of wet, viz., a very wide-spread attack of monilia, even upon varieties not usually much subject to it. When the time came for cherries, no cherries were left, for, between the dropping from weakness of stem, the monilia and the blasting, the whole of the Early Purple and Governor Wood cherries failed to ripen.

Such varieties as held on ripened most irregularly. Early Richmond ripened about July 1st in some orchards, and much later in others. Of Black cherries, about half ripened July 8th, and the balance were still very green, except a large share which blasted or rotted.

Altogether, the crop was such a failure that we are unable to give such an extended report as we hoped to do. We have added a large number of new varieties from the Baltet Nurseries, Troyes, France, and we hope by these not only to verify the older varieties in cultivation here, but also to find some new and more valuable varieties. The trees came in splendid condition and every one grew well.

We succeeded in putting up a few cherries in bottles for the Pan American, but it was a great disappointment that we could not put up sixty or seventy varieties as we had anticipated. We hope next year to make a sufficiently important report to make up for the shortness of this one.

Spraying has this season been proven effective in a commercial way with cherries. In the vicinity of Grimsby, the monilia has been very serious, resulting in the total destruction of the cherry crop. At first a large crop seemed to set and begin to grow, but most of them blasted. Still we expected a good crop of certain varieties, as, for example, Black Tartarian, which showed up fairly well as they turned black on the trees, but a day or two later, when we began gathering, the rot had begun its work, and in forty-eight hours nothing was left worth gathering. Even Montmorency and English Morello went the same, scarcely giving a perfect sample.

In the midst of this universal failure, we have to record the most signal success in spraying for cherry rot. Mr. McKinnon, near Maplehurst, sprayed twice with Bordeaux as the young cherries were growing, and, as a result, gathered about 300 baskets of Kentish and Morello cherries. Spraying a young cherry orchard, probably two or three days work in all, paid a profit of about $300. Mr. Brennan, next to Mr. McKinnon, had similar results, and these two stand almost alone in having cherries to ship this season. Indeed, very few persons had even enough for home uses.

At Winona, Mr. W. M. Orr, formerly Government superintendent of spraying, reports the same remarkable results from spraying. He gave several applications of Bordeaux to his Flemish Beauty pears, keeping the trees green with it throughout the growing season, and, as a result, he had a magnificent crop of perfect pears on a variety that is always most subject to scab, and usually worthless in consequence. He treated his cherry trees in the same way, and, as a result, had a magnificent crop of Black Tartarian and other varieties. He sent samples to the Ontario fruit exhibit at Buffalo, and Mr. Bunting reports that they were the finest shown.

The following are a few notes of the varieties of cherries which matured their fruit:—

Early Richmond showed the first ripe cherries about the 1st of July, but ripened very irregularly, owing to curculio. A few samples of this variety were sent to the Pan-American fruit exhibit.

Governor Wood and *Cleveland* are the first really desirable varieties, but this season there was not even a single specimen of Cleveland, and the samples of Governor Wood which did set were either so rotten or wormy that they were worthless. It ripened about July 1st.

Knight's Early Black showed fairly at first, while still green, but by July 8th, when about ready to harvest, they were nearly all destroyed by curculio, or blasting or dropping.

American Amber, which is usually not wanted in competition with Governor Wood or Elton, was this year almost the only cherry of its season. About half the crop was blasted or rotten, while the balance was much under size.

Black Tartarian looked well up to about July 1st, when monilia attacked them, and by the 8th over half were ripening and many of them rotting badly. The fruit was very irregular in size. We began harvesting on the 8th in order to save as many as possible.

Olivet was turning red on July 8th, with about one quarter of a crop. The tree is vigorous, outgrowing Montmorency.

NOTES BY G. C. CASTON. (*Simcoe Fruit Station.*)

Many of the Cherries under test are Russians, but unlike the Russian apples are a valuable acquisition. Several varieties have borne fruit and with the exception of Vladimir, all have proved to be of good quality and valuable for culinary use. There has been lots of trouble with wrong naming of varieties by the nurserymen sending them out. One labelled " Ostheim " turned out to be Early Richmond, and many other similar mistakes were made, requiring a lot of trouble to get right. Everything that came from the Central Experimental Farm at Ottawa, was evidently labelled correctly.

Litham Tree free healthy grower, with very fine willow-like brush, requires frequent pruning. Fruit, small, nearly black when ripe, a little astringent but cans fairly well.

Greiner Glass. Tree healthy, vigorous, and early bearer prolific. Fruit large, $\frac{3}{4}$ in. in diameter, sub-acid, dark red when ripe, resembles Morello, a good canner.

Red May. Tree vigorous, upright, rich dark foliage. Fruit large, over $\frac{3}{4}$ in., stem 2 in. Dark red, very handsome, quality very good, very promising.

Schattan Amarelle. This is, as I have it here, evidently the English Morello under another name, but another tree in same row that came with it may be the true Amarelle. This tree is healthy, bears young. Fruit large, over $\frac{3}{4}$ in., very juicy, meaty, very free stone, stem slender over 2 in., skin bright red, a very handsome cherry, excellent for culinary use.

Spate Amarelle. This is a *fac simile* of the preceding one, evidently the same under another name.

Love Apple. This Cherry with rather a queer name is a very superior variety. Tree an upright grower, healthy, vigorous, rather a shy bearer while young. Foliage rich with large leaves. Fruit bright red, large, meaty, with a sweet rich flavor. Stem medium. An excellent dessert variety.

Grenner Glass. Tree vigorous, healthy. Fruit large, bright red, a little flattened at the ends, quality first-class for canning Stem short, stout. A very promising variety.

Russian 207. Tree vigorous, healthy, but with smaller leaves than the other varieties, spreading habit of growth. Fruit large, handsome, bright red, rather acid, but cans fairly well. Stem very long and slender.

Wragg. This is English Morello under another name. Several young trees have not yet come into bearing. I may find the true Wragg among these.

Strauss Weichsel. Tree, a medium grower, healthy; fruit above medium size, black when ripe, and of splendid quality. The robins seemed to appreciate the superior quality of this cherry, for they quickly appropriated the few specimens that were on the tree.

Lutovka. A promising Russian variety tree; a thrifty, healthy grower, but does not bear as early as some of the others; fruit, large, flattened, bright red; stem, medium, stout: quality, very good.

Sklanka. Resembles Early Richmond, but is a week later.

Orel. Tree, spreading habit of growth ; healthy, with small leaves ; fruit, large, bright red, very handsome ; stem, $1\frac{1}{2}$ in. ; quality, very good. Ripe, July 16.

Orel 24. A black variety, resembling Ostheim ; of medium size, and excellent for canning.

Ostheim. This is my favorite of all the Russian varieties. The tree is not so vigorous or the foliage as rich as in many of the others. But the fruit for canning purposes, in my opinion, easily excels them all. The tree bears young, and is quite prolific. The fruit is of medium size, and nearly black when ripe.

Brusseler Braun and *Griotte du Nord* resemble each other very closely. They are both shy bearers. Trees are vigorous and healthy ; fruit, dark red, large, with long, coarse stems ; quality, fairly good ; ripens very late, first week of August.

The first to ripen was Early Richmond, a week later Sklanka, then Lutovka and Russian 207. Then the other varieties may be said to have come in together. So that the season extended from the first to about the 20th of July, with the exception of the two varieties above noted, which did not ripen until August.

Yields —The most prolific are Dyehouse and the English Morello. Dyehouse, planted in 1894, yielded 6 baskets, or 60 Imperial qts. to the tree English Morello, planted in 1896, yielded 30 qts. These yields were from some of the best trees. Ostheim, planted in 1896, gave 25 Imperial qts. Orel 24, about the same, though an older tree. Litham, the small black cherry already described, came close to the Morello in yield. It was planted at the same time. All the varieties mentioned and described in this report gave excellent satisfaction to those who bought them. They were all pronounced to be first-rate for canning. So that, with their healthy growth, hardiness, early bearing and quality of the fruit, we have a valuable acquisition for this section in those hardy cherries.

Notes by A. E. Sherrington. (*Lake Huron Fruit Station*)

Cherries. There are now about twenty-two varieties planted at this station. Nearly all varieties are thriving and doing well ; they are cultivated the same as the plum orchard. Very little pruning is necessary to be done in the cherry orchard—a little thinning out and heading in where certain limbs are making too rapid growth. Notes follow on a few of the varieties that fruited this season.

English Morello. Tree, a rather slow grower, but hardy ; will make a good orchard tree ; fruit large, $3\frac{1}{4}$ x $3\frac{1}{4}$; stem, $1\frac{1}{2}$ in. long ; color, dark red, pit small, flavor tart, with colored juice ; date of blooming, May 18th ; ripe, July 22nd ; yield, 13 pounds ; four years old.

Empress Eugene. Tree, quite vigorous, apparently hardy, large seven-eighths by three quarters inches, stem two inches long, color bright carmine, flesh firm, flavour sweet, bloomed May, 11th, ripe July, 16th, yield two pounds ; three years old.

Late Duke Tree, a small upright grower, hardy, fruit large, one by seven eighths inches, stem two inches long, color dark red, pit large, flesh firm, flavor sub-acid, quality good, ripe July 16th, yield 12 pounds; four years old.

Montmorency. Tree vigorous and hardy, spreading fruit medium size, five-eighths by three-quarters inches, stem one and a half inches, color red, pit small, flavor acid, fine for canning, a profitable variety, bloomed May 11th, ripe July 17th, yield 12 pounds per tree ; six years old.

Ostheim. This is a very ornamental tree, it would not be out of place in the lawn, limbs slender and drooping, foliage, dark green, hardy, fruit medium size, three-quarters by five-eighths, stem one and a half, color dark red, almost black, quality very good, nearly sweet, pit small, bloom May 11th ripe July 18th, yield 12 pounds ; four years old.

Olivet. Tree resembles *Montmorency*, a little more upright in growth, vigorous and hardy, fruit large, color red, flavor acid, firm, quality good, bloom May 9th, ripe July 16th, yield four pounds ; five years old.

Wragg. Tree good, strong grower, upright to spreading hardy, fruit large, three-quarters by three quarters inches, stem one and a quarter to one and a half long, color dark red, flavor tart, colored juice, pit medium, quality only fair, bloomed May 17th, ripe July 22nd. yield 22 pounds ; four years old.

Windsor. Tree resembles *Heart* varieties, but more spreading, a vigorous grower, but not quite as hardy as it might be in this section, fruit large, liver colored, quality good, flavor sub-acid, bloomed May 7th, ripe July 1st, yield none, as the birds took the whole crop; five years old.

Yellow Spanish. Tree a rather poor grower, spreading half hardy, fruit large, fine and sweet, color yellow, bloomed May 5th, ripe July 1st; the birds got those also; five years old.

Reine Hortense. Tree, upright spreading, vigorous, and appears to be hardy, fruit very large, bright red, quality good, bloomed May 9th, ripe July 10th.

CURRANTS.

NOTES BY A. W. PEART. (*Burlington Fruit Station.*)

Currants were a fine crop. Prices were higher than for many years, ranging from five to six cents per quart for red and eight to nine cents for black.

In red varieties, Wilder again takes the lead with an average of seven and a half quarts per bushel. Red Cross and Pomona also did well, the latter especially being very promising both in yield and quality. The berry of the Red Cross is rather small. The Cherry still holds its own as a desirable market variety. Fay's Prolific, although a fine currant, does not crop so heavily as the Cherry.

In the black varieties, Collins' Prolific, Saunders and Naples take the lead in the order given. Collins is a very rank, vigorous growing variety, but begins bearing somewhat late. Saunders promises well, while the Naples still maintains its reputation for commercial purposes

In white currants, the White Grape is more productive than the White Imperial, but lacks the fine quality of the latter.

Belle de St. Giles. Bush, medium vigor, healthy and hardy, but not very productive; bunch, long and compact; berry, red, large, sub-acid, of excellent quality. Season, medium. Scarcely productive enough for commercial purposes.

Black Victoria. Bush, of medium vigor, healthy, hardy and productive; berry, large, firm, sweet, of fine quality. An early black variety.

Brayley's Seedling. Bush, vigorous, healthy, hardy and productive; bunch, long, straggling and loose; berry, red, medium sized, very acid. Season, medium.

Champion. Bush, vigorous, healthy, hardy and moderately productive; berry, very large, black, somewhat acid. A late black variety.

Cherry. Bush, strong, upright, vigorous, healthy, hardy and very productive; bunch, somewhat short, compact; berry, dark red, firm, large, acid, of fair quality. Season, medium. Probably the most generally profitable of the older red currants.

Collin's Prolific. Bush, a very rank, strong grower, healthy, hardy and productive; berry, large to very large, black, firm, acid. Season, medium to late This variety is very promising.

Crandall. Bush, hardy, healthy, vigorous, rampant and productive; berry, variable in size, from medium to very large, bluish-black, of a sprightly sub-acid flavor. Season, July 15th to Sept. 1st. It ripens by degrees, and seems inclined to bear heavily every other year. Its commercial value cannot be estimated as yet.

Fay's Prolific. Bush, a fair grower, hard, healthy and moderately productive; bunch, very long, somewhat loose; berry, large to very large, red, firm, sub-acid. Season, medium. Requires a rich soil.

Lee's Prolific. Bush, moderately vigorous, healthy, hardy and moderately productive; berry, black, very large, sub acid. Season, medium. A good commercial currant but requires a rich, well-kept soil.

Naples. Bush, strong, vigorous, hardy, healthy and very productive; berry, large, black sub-acid. Season, medium One of the best blacks.

New Victoria. Bush, vigorous, hardy, but not very productive; bunch, long, loose; berry, red, small to medium, acid but rather pleasant in flavor. Season, medium.

North Star. Bush, medium vigor, hardy, healthy and moderately productive; bunch, medium length, compact; berry, red, medium to large, acid but sprightly and good in flavor. Season, medium to late. Has a place as a late red currant.

Pomona. Bush, vigorous, healthy, hardy and productive; bunch, long, compact; berry, red, large, sub-acid, of excellent quality. Season, medium. A promising new variety.

Prince Albert. Bush, vigorous, healthy and hardy, leaves large and deeply cut; bunch, short to medium; berry, small to medium, red, very acid. Season, late.

Raby Castle. Bush, vigorous, hardy, healthy and very productive; bunch, short and compact; berry, red, small to medium, firm, acid. Season, medium. Very productive, but too small.

Red Cross. Bush, medium vigor, hardy and productive; bunch, short and compact; berry, small to medium, red, firm, sprightly, sub-acid. Season, medium.

Red Dutch. Bush, strong, healthy, hardy and productive; bunch, medium length, loose; berry, red, small, sub-acid of fine flavor. Season, early to medium.

Red Victoria. Bush, strong, hardy, healthy, vigorous and very productive; bunch, long and loose; berry, large, bright red, tenacious, firm, acid but of good quality. Season, medium. A good commercial variety.

Saunders. Bush, strong, vigorous, hardy, healthy and very productive; berry, black, large, of a good sub-acid flavor. Season, medium to late. A promising commercial currant.

Versailles. Bush, moderately vigorous, healthy, hardy and fairly productive; bunch, medium length and fairly compact; berry, red, medium size, not so acid as the cherry. Season, early to medium.

White Grape. Bush, medium vigor, hardy and productive; bunch, long and straggling; berry, white, large, sub acid pleasant in flavor. Season, medium to late.

White Imperial. Bush, vigorous, hardy, healthy and moderately productive; bunch, long and loose; berry, white, large, of excellent quality. Season, medium. A fine dessert currant.

Wilder. Bush, vigorous, hardy, healthy and very productive; bunch, medium length, compact; berry, red, large, sub-acid of excellent quality. Season, medium. A most promising red currant.

Notes by A. E. Sherrington. (*Lake Huron Fruit Station.*)

Currants. The currant crop was very good this summer, the demand for the fruit was extra good, at fair prices; there are now fifteen varieties planted, all seem to thrive and do well, very little difference in habits and nature of growth. They are all vigorous growers with exception of Cherry, which is a rather slow grower, but a good yielder of very large fruit.

Black Victoria. Plant, strong, vigorous and hardy, fruit large, quality good, ripe July 26th, yield four oz, two years old.

Cherry. Plant, rather slow grower, not so vigorous as Fay's, but hardy, fruit very large, quality of the best, color red, ripe July 16th, yield one lb., five oz., five years old.

Champion. A strong, vigorous grower, fruit large, color black, quality good, ripe July 16th, yield two lbs. per bush, five years old.

Naples. A strong, vigorous grower, healthy and hardy, very productive, fruit large, color black, quality good, ripe July 26th, yield five qts. per bush, three years old.

North Star. A fair grower of spreading habit, rather weak canes, fruit small, color red, quality poor, ripe July 28th, yield one lb., two years old.

Pomona. Plant, a good, strong, compact grower, fruit medium to large, color red, quality first class, this is the sweetest currant in the plot, ripe July 10th, yield four lbs. per bush, three years old.

Prince Albert. A strong upright grower, forming a compact bush, foliage very handsome, bush quite ornamental, fruit bunches long, medium size, color red, quality fair, ripe July 26th, yield one lb., 5 oz., two years old.

Raby Castle. A vigorous and rapid grower, very hardy, fruit small, color red, quality only fair, flavor tart, ripe Aug. 20th, yield five lbs., six years old.

Saunders. Plant, vigorous, strong and hardy, fruit medium, color black, quality very good, ripe Aug. 28th, yield four oz., two years old.

Versailles. A vigorous, strong grower, fruit large, color red, quality good, ripe July 20th, yield one lb , two years old.

Red Cross, White Grape, and *Crandle* were planted this spring. All made an excellent growth.

GOOSEBERRIES.

Notes by Stanley Spillett.

Autocrat gave as usual a large crop of large green berries of medium quality. Skin of fruit very thick and tough. It mildewed more than pure English varieties but less than most of the English seedlings. Bush, a good grower ; yielded 4 quarts to the bush ; sold at 6 cents per quart.

Whitesmith gave a large crop of medium sized yellow berries of good quality. Skin, thin for an English variety. Bush, almost as good a grower as Downing. For general planting this is the best all-round English gooseberry I have ; yield, 4 quarts, at 6 cents.

Queen Chautauqua, *Golden Prolific*, *Large Golden Prolific*, *Yellow Scotch*, *Columbian Dominion*, and *Mrs. Whittaker* all gave large crop of large yellow berries of good quality so much alike that it would be hard to distinguish them. All mildewed badly. 3 qts. at 6 cents.

Ontario. A very promising large berry of poor flavor. Bush, a good grower.

Crosby's Seedling. One of the largest berries ; red ; good flavor. Skin, thick and tough Mildewed badly. Bush, a good grower but sprawling.

Keen's Seedling. Bush simply will not grow wood. A few beautiful berries of fine flavor.

Keepsake. Berry, large and roundish ; good flavor. Skin, thick and tough ; less affected by mildew than any other except Ontario. Bush, medium grower. 2 quarts, at 6 cents.

Crown Bob. 2 quarts of fine berries.

Triumph might be classed with Chautauqua. Large yellow berry of good flavor.

Lancashire Lad. A large, red berry of fine flavor. Skin, thick. Bush, poor grower. 1 quart, at 6 cents.

Green Chisel. Pure English berry ; large ; green ; poor flavor. Skin, thick and tough. Bush, best grower of all the varieties imported. 1 quart, at 6 cents.

Cook's Eagle, *Ingram's Ocean*, and *Ironmonger* gave a small crop of very large berries, greenish white. Skin, thick and tough. Bushes, poor growers.

Loudon and *No Name* gave nice crop of berries of the size of small Downings, of poor flavor. Skin, thick, hairy. Bushes, poor growers.

Marion gave 1 quart of very large berries ; yellowish white ; poor flavor. Skin, thick. Bush, poor grower. 1 quart, at 6 cents.

American Varieties. *Champion* gave a large crop of greenish white berries as large as Downing. Medium quality. Thin, tender skin. Bush, a great grower. Free from mildew. This berry gets its growth fully two weeks earlier than any other variety except Smith's Improved. Best for pickling green. 8 quarts, at 5 cents per quart.

Downing and *Pearl* are too well known to need any description. Best sweet berries. 6 quarts, at 5 cents.

Oregon Jumbo is a Red Jacket, and *Success* a Downning.

Red Jacket gave a large crop of beautiful, pinkish, transparent berries. Acid fruity taste. Skin, thin and tender. Berry, 1 inch long, while best Pearl was $\frac{7}{8}$ inch. Twelve berries weighed $2\frac{1}{4}$ ounces ; Pearl, $1\frac{3}{4}$ ounces. Free from mildew. Bush, the best of all growers after the second year. Best for either home use or market, unless one can grow Whitesmith. $7\frac{1}{2}$ quarts to the bush, at 6 cents.

GRAPES.

Notes by L. Woolverton. (*Maplehurst Fruit Station.*)

Jessica. When well grown and well ripened the Jessica is a variety of which we are not ashamed to say that it is of Canadian origin. Our photograph on page 10, well represents its appearance, and is almost a fac-simile of a colored plate prepared for Mr. Beadle by Rolph Smith & Co., of Toronto, in 1884. It is too small a berry for the commercial vineyard.

Its previous reputation as a dessert grape has been borne out this season by its conduct in our experimental plot. Near it we had the Green Mountain, and on selecting samples of both for photographing we were much struck with their close resemblance in bunch and berry. The flavor of our Canadian was superior to Green Mountain, but otherwise one could declare them identical. We, in Canada, have been much disappointed in the latter, which was introduced with so much *eclat* by Stephen Hoyt & Sons, of Connecticut. It is too small for market and inferior as a dessert grape to Jessica, and yet the Bushberg catalogue gives nearly a column to it, and less than an inch to the latter; while the Jessica is not even mentioned in the catalogue issued by the American Pomological Society.

We have had a remarkably fine showing of grapes of all kinds at Maplehurst this season.

Moyer was the first to ripen, and was quite delicious eating long before Early Victor, Berckman, Ohio or Campbell's Early were ready for use. That variety is another that is valuable for a home garden, but probably not profitable for market because of its small berry and straggling bunch, but it is a treat to get so pleasing a flavored grape so early in August. The Moyer, too, is of Canadian origin.

Notes by M. Pettit. (*Wentworth Station.*)

One hundred and forty-three varieties of grapes fruited the past season. The crop as a whole ripened better than usual, but many of the newer kinds are very disappointing when compared with the old and reliable market varieties.

Alice, a new and highly lauded variety, bore a very good crop considering the size of the vines. It so closely resembles the old Diana, that an expert cannot tell the difference. If not Diana, it does not appear to be an improvement on it.

Amber Queen, which promised to be of some value, is subject to mildew. It does not yield enough to be profitable, and when left on the vine for some time after ripening turns a dull dark color and loses both its sprightly appearance and flavor.

Brilliant, a medium sized red grape of excellent flavor. The vine is very healthy, and vigorous. It produced 22½ lbs. to the vine; the clusters are rather small and loose. I do not think it could be profitably grown in comparison with the larger and more productive Red Roger varieties.

Campbell's Early, from every indication this grape can be strongly recommended for general cultivation in this part of Ontario. The special merits of this grape are that it ripens nearly as early as the Champion; the vine is vigorous and productive; the fruit is large and attractive; the skin is tough; pulp, rather firm and sweet; the seeds separate readily, and it clings well to the cluster without dropping. Unless it develops some weakness not yet seen, it should be grown extensively and take the place of Champion and other inferior early grapes.

Dr. Collier, one of the most profitable of the newer black grapes. It very closely resembles Concord in appearance, flavor, and time of ripening; the vine is healthy and free from mildew. I do not think it would produce as much fruit as Concord.

Early Victor, a very productive black grape; bunches compact, medium sized; quality good, vine, vigorous hardy and healthy; yield 26½ lbs. to the vine; it ripens a little earlier than Concord.

Woodruff's Red, a fine large showy grape, fairly productive; not quite good enough in quality.

Mills, at first considered productive but lacks vigor; it does not produce enough bearing wood for a crop; the quality of the grape is good and one of the very longest keepers.

Winchell, a white grape, at first considered profitable, also lacks vigor of vine. A great many of the white grapes planted at this station are of little value when compared with Niagara as a profitable market grape.

Moore's Diamond, comes next in profit; it ripens earlier than Niagara, and on that account brings a higher price; but it does not produce more than half the quantity.

In red grapes, *Agawam*, (Rogers No. 15) heads the list for profit; a regular, heavy bearer; good shipper; and it always commands a fair price. *Catawba*, *Requa*, (Rogers No. 28) and *Lindley*, (Rogers No. 9) are also some of the most profitable.

In Black Grapes. *Worden*, *Concord*, *Wilder* (Rogers No. 4), *Barry* (Rogers No. 43), and *Herbert* (Rogers No. 44), are the most profitable.

PEACHES.

Notes by L. Woolverton. (*Maplehurst Station.*)

The season opened at Maplehurst on the 27th of July, with the Sneed, the earliest good peach, and one that well deserves to be planted freely. It is agreeable in flavor, very juicy, but a poor market peach, because it ripens too rapidly; but it is much more desirable for dessert than such varieties as Alexander, Hale's Early, Early Purple, Rivers, etc. For shipping it must be picked while still quite firm. On the 1st of August we found many prematures already overripe and fallen.

The *Alexander* succeeded this variety about the 5th of August, and kept up the shipments until about the 13th. Owing to the scarcity of the fruit, the prices of these early varieties were better than usual.

The *Triumph* peach was harvested between the 15th and 21st of August, and was the best market peach of its season at Maplehurst. It is a yellow fleshed peach, and not a close cling-stone as most early peaches are, so that it suits a demand in Canada for yellow-fleshed peaches. The tree is vigorous and productive, but is inclined to blight as the fruit ripens, if conditions favor, a disease which sometimes attacks both twigs and fruit. The fruit is dull in color and very thickly coated with down which stands in the way of its popularity.

Early Rivers is a white fleshed peach about the same in season as Triumph (August 15th to August 25th in 1901) and was at one time largely planted in Ontario. We harvested about two or three hundred baskets in 1901 at Maplehurst, but found them the most unsatisfactory of any peaches for shipping, because they are so tender in flesh and ripen so rapidly. Besides, every mark causes discoloration.

Greensboro', a new white fleshed peach from North Carolina, with red cheek, above medium size and rather attractive, is also of about the same season as the Triumph. It is also too tender in flesh to be a profitable market peach; still it is much superior to the Early Rivers.

Hynes is another white fleshed early peach of the Alexander type, more agreeable for dessert, but averaging smaller in size. It ripens about the 20th of August, and, we judge, is not likely to be much planted for market, as it is much inclined to rot on the trees and seems to be quite subject to yellows.

The *Yellow St. John* was the first really good yellow peach, and it colored up beautifully about the last week in August, when fine samples would almost pass for Early Crawford. It is a valuable market peach. but, when it is left to hang into September, there is a great waste from rot.

The *Champion* came in about the 1st of September, closely following the Yellow St. John, and the last specimens were gathered about the 7th with the first Crawfords. It is a beautiful white peach with red cheek, and of large size, frequently measuring 2½ inches in diameter. The stone is free, the flesh is white, tender, juicy and the flavor is delicious. We consider it the best dessert peach of its season.

The *Early Crawford* began ripening on the 6th of September, and, when it is going forward, really no other variety can compare with it either for size, beauty or general excellence. The crop was fairly good, and the price from 75c to $1.00 a basket. Where the trees were highly fertilized, the increase in productiveness was very evident.

Fitzgerald came in about the same season as Crawford, and seemed to be similar in many respects.

PEARS.

NOTES ON SUMMER PEARS BY L. WOOLVERTON. (*Maplehurst Fruit Farm.*)

Our experimental plot of dwarf pears consists of over fifty varieties, and we had hoped for a splendid assortment of samples for our report, but, unfortunately, the same condition which blighted our hopes as commercial fruit growers, also swept away our hopes of a grand collection of varieties for study and for exhibition purposes.

The first pear to ripen with us in the season of 1901 was *Summer Doyenne*, about July 30. The fruit was in clusters, very small, too small for market, but of delicious quality for dessert. The trees are not as thrifty as Brandywine or Wilder. The last picking was Aug. 12th.

The *Chambers* closely followed the Summer Doyenne, ripening about the 5th of August. The trees were heavily loaded, and the fine size of this pear makes it the most promising variety of its season for market. The tree is vigorous and healthy and, so far, has not shown any tendency to blight. The last picking was August 20th.

The *Giffard* closely followed Chambers in season of ripening, coming in this year, which is unusually late, about August 10th. It yielded a good crop, and the quality is so good and its appearance so pleasing, that it is the most largely planted for market in the Niagara district of any early variety.

Osband's Summer ripened about August 10th, and was over-much planted; this year the trees were heavily loaded, but very small, especially on the older trees. We do not recommend this variety now that finer ones of the same season have come in.

Lawson and *Andres des Portes* ripened about August 12th, on dwarf trees, but both are rendered worthless by a fault in common, namely, the rotting at the core almost before maturity. Lawson is a beautiful pear and the tree is very vigorous, but this season is unproductive and fruit stung with the curculio.

Wilder ripened about the same time, reaching full maturity and beauty about August 15th. The quality is fine when not allowed to hang too long and become mealy. The pears grow to above medium size and take on such gorgeous coloring that passers by are compelled to stop and look in wonder. Surely this would be a grand seller.

Manning's Elizabeth began to ripen on the 17th of August and continued in use, many still hanging, until the end of August. They were borne in great clusters and the tree showed great productiveness, but the fruit was too small to be valuable for market. The quality was very good.

Rostiezer came in about the same time, and was unusually large, averaging 2¼ inches in transverse diameter. The quality is the very best for dessert purposes, but, owing to its dull green color, it would not sell for any more than other small pears, and brought only about 30 cents per twelve quart basket in the Ottawa market. If this pear could have the superb coloring of the Wilder, it would be a wonderful treasure.

The *Tyson* began ripening about the last week in August, and, if left hanging, would come in about with the Bartlett, but it is so much smaller and inferior to that variety that we gathered the Tyson while still green and shipped them forward so that they might not come into competition. The trees are wonderfully healthy and vigorous. Some of them are now fifty years old and have never shown the least indication of blight.

The *Brandywine* began ripening about August 23rd. The samples were above medium size for pears, and fairly attractive, with dull red cheek on a yellow ground.

Clapp's Favorite was harvested about August 20th. It had attained full size and color, but was not ripe. The samples were magnificent. No pear of its season equals it for market. The year previous we exported a large share of our Clapps at the best prices.

Doyenne Boussock bore a magnificent crop; one tree twenty-five years planted yielded twelve baskets of fine pears. This pear ripens throughout September, about the same season as Bartlett, but we usually harvest it in advance of that variety.

The *Bartlett* came in about the 1st of September, and continued ripening until its season was over, about the 15th of September. It was subject to knots and scabs on clay soil, poorly cultivated, but, where cultivated and manured, it gave a magnificent crop of very fine fruit. We put up several hundred cases for the Glasgow market, and will report the result later on in the season.

Among the newer pears, we were much pleased with *Ansault* as a dessert pear. Too soft for distant shipment, it would find a place only in the gentleman's garden. It is not very attractive in appearance, being a dull green, nearly covered with russet, but when cut it reveals the finest and most delicate texture of flesh which can be described only by the old term "buttery," while its rich, sweetly perfumed flavor is most agreeable.

NOTES BY A. W. PEART. (*Burlington Fruit Station.*)

Bartlett Seckel Planted 1898. Tree an upright moderate grower. No fruit yet.

Beurre Giffard. Planted 1896. Very fair but somewhat slender grower. Spreading habit. Fruit medium, pyriform, greenish-yellow with red flush on sunny side. Flesh juicy, melting, of good quality. Season, early August.

Buffum. Planted 1897. A strong, upright grower. Pear small to medium, oblong-obovate, yellowish-red, slightly russet, sweet, pleasant flavor. Season, September.

Dempsey. Planted 1898. Moderate grower. No fruit yet.

Easter Beurre. Planted 1897. Tree upright-spreading, moderately vigorous. No fruit yet.

Idaho Planted 1896. A moderate grower, subject to blight. No fruit yet.

Josephine de Malines. Planted 1896. Moderately vigorous, upright-spreading. Fruit small to medium, roundish, slightly conical, yellow, juicy and sweet. Season, winter.

Lawrence. Planted 1896. Tree a strong upright-spreading grower. Fruit small to medium, obtuse-pyriform, yellow with some russet, juicy, melting and sweet. Season, early winter.

Lawson. Planted 1896 A moderate grower. No fruit yet.

Lincoln. Planted 1898. A strong grower. No fruit yet.

Osband's Summer. Planted 1897. Tree moderately vigorous, upright. Fruit medium, obtuse pyriform. Season, August.

Petite Marguerite Planted 1896. Tree vigorous, upright spreading. Fruit small to medium. obovate, melting, juicy and agreeable. Season, late August.

President Drouard. Planted 1897. Tree a moderate grower, upright. Fruit obtuse-pyriform. Season, late fall.

Sudduth. Planted 1897. Tree spreading, moderate grower. Fruit, medium. Season, fall.

Summer Doyenne. Planted 1896. Tree a moderate, upright grower. Fruit small, conical melting and juicy. Season, early August.

Tyson. Planted 1897. Tree a moderate, upright grower. No fruit yet.

Vermont Beauty Tree a moderate, upright grower. No fruit yet, although planted in 1896.

Wilder. Planted 1896. Tree a strong upright grower. Fruit obovate conical, medium, rich and sweet. Season, middle of August.

Winter Nelis. Planted 1896. Tree a moderate spreading grower. Fruit roundish-obovate, small to medium, russet skin, fine grained juicy and sweet. Early winter.

French Pears. Planted in June, 1890. All the varieties have lived and grown well, ranging from a foot to two feet of new wood this season. Bonne de Malines, Bergamotte Esperen, Dr. Jougré, Triumphe de Jedoigue, Citron de Carmes and Souvenir de la Salle have made the strongest growth.

NOTES BY HAROLD JONES. (*St. Lawrence Station.*)

The pear orchard was given clean cultivation from early spring to July 18th, when it was sown with red clover, which has made a good stand, and now gives a heavy deep covering over the entire ground. The trees have made a strong vigorous growth and the wood is well ripened up for the coming winter.

There was no injury to the trees last winter and spring, but the fruit buds on Dempsey, Goodale and Japan Golden Russet were injured.

Flemish Beauty. Planted 1894. Blossomed and the fruit matured perfectly. Free from spot or blemish. Given three sprayings. A hardy and desirable variety for this section. Spots and cracks badly when not sprayed.

Keiffer's Hybrid. Planted 1896. Has fruited for the third time a crop of well matured fruit. This tree is a strong, healthy grower and an early and heavy cropper. Fruit free from spot or other injuries, and when picked about the 10th October and allowed to ripen in a warm dark place is very attractive. This pear, though not of high quality, will be very desirable in this section, where we have so few to choose from.

Beurre Clairgeau. Planted 1896 Has suffered from blight and sun scald and has been a failure generally, making very poor, feeble growth and developing no fruit buds. In the spring of 1900 I top worked a few cuttings on Bessemianka, and this year had three or four fine specimens of fruit on the grafts one year old This fine variety gives promise of being a success top worked on hardy stock, but undesirable on its own roots.

Bessemianka. Planted 1896. A Russian of very poor quality, subject to blight and undesirable where Flemish Beauty or Keiffer can be grown.

Fruit small and worthless unless it is used green for cooking or pickles.

Petite Margueritte. Planted 1898. Has borne a few specimens for two years, and gives promise of being a very desirable early pear for home use. Fine, healthy and vigorous. Fruit small but quality good. Desirable.

Notes by G. C. Caston. (*Simcoe Fruit Station*)

Flemish Beauty is quite hardy here, but if you had a barrel of Bordeaux mixture under the tree and sprayed it every day you could not keep it clean I am top working with Bartlett, and they make excellent stock for that purpose. The Russian pears, Bergamot and Bessemianka, bear well, but the fruit has no quality to recommend it. They are only useful as stock for grafting good varieties on. Two trees that came here from Normal, Illinois, in 1896, under seal, and named "Sudduth" bore fruit this year, and it is no better than the Russians. It is as far behind our best pears as the Ben Davis apple is behind the Spy.

I have tried Dwarf Pears here on my own account outside of the experimental plot, and they have always failed. I would not advise anyone to plant Dwarf Pears in this section. My advice would be to plant Flemish Beauty and Russian Standards, and top work them with the best varieties of early, medium and late pears. Though I believe good orchard land will in future give better returns in apples than in pears.

Notes by R. L. Huggard. (*East Central Fruit Station.*)

Angell. A weak grower.

Bartlett Seckel. A slow grower ; handsome fruit of good quality. October.

Belle de Esperan. Stocky, bushy, fruit round, small, no use here.

B. S. Fox. Fair grower, large medium yellow, slightly russett.

B. Clairgeau. Fruit large, skin brownish red, good quality, productive, hardy. November and December.

Dr. Jules Guyot. Fruit large, handsome, of better quality than Bartlett, which it resembles. October 3.

Duchess of Bordeux. Fruit medium to large, a good keeping variety.

Dempsey. Four years planted, yield 22 fruits, growth 27 inches, a rapid grower of large fruit, smooth skin, quality very good. October.

Doyenne d' Ete. Four years planted, heavily loaded with fruit, a profuse bearer of small handsome fruit of fair quality, no use for the commercial orchard. July.

Dorset. Fruit large, smooth and handsome, healthy and hardy, a good new variety. September and November.

Eastern Belle. Yield 20 fruits, fruit medium, smooth, sweet and delicious; gathered fruit 16th of October.

Easter Beurre. Bearer of large fruit, skin rough, slightly russeted ; quality good for a late pear. Keep till July.

Fred. Baudry. Only a medium grower, not yet fruited.

Flemish Beauty. Spots and cracks, not worth growing here.

Frederick Clapp. A fair grower, fruit medium to large, yellow with a red blush, white, of fair quality, very juicy when fully ripe. October 25.

Goodale. A medium grower, fruit large and even size; skin smooth, yellow when fully ripe. October 20. Quality fair to good, hardy.

Graslin. Spreading slow grower, good bearer, fruit large, rough, skin slightly russeted, red on sunny side, quality good. November 1.

Howell. One of the best fall pears, foliage thin, good grower and abundant bearer of medium to large smooth fruit of the finest quality; October 15; requires thinning for best results, hardy.

Hoosic. Upright, stalky, fair bearer, fruit medium to large, dark green, quality fair to good. November 20.

Idaho. Upright, stalky, medium foliage, fruit medium to large, nearly round, yellow, rough skin, white flesh, quality medium to fair, November 1, good bearer.

Indian Queen. Vigorous grower, fruit medium, of good quality, hardy and productive.

Josephine de Malines Straggling, free grower, foliage light green, somewhat tender, fruit small, bell shaped, of good quality. January and February.

Keiffer's Hybrid. Very vigorous and exceedingly productive, large glossy leaves, fruit large, rather rough skinned, yellow, with blush when fully matured, quality fair to medium, good for canning, flesh white and firm. October and November.

Japan Golden Russet. Very upright, resembles Lombardy poplar, fruit medium, round, russet, with yellow skin and innumerable small dots, quality inferior. February.

Krull. Yield 4 fruits, October 1; a good grower, fruit resembling Louis Bonne de Jersey, but keeps later in season. October and November.

Koonce A rapid upright grower, with glossy leaves, somewhat pointed; healthy and hardy, fruit only medium, either as to color or quality. November.

La Lecteur. Fruit medium size, handsome, of fair quality. October 15.

Lincoln Coreless. Very thin foliage, glossy, fruit dropped prematurely.

Lady Clapp. Fruit yellow, resembling Clapp's Favorite, but smaller. October.

Leconte. Fruit large, yellow and abundant, with a decided quince flavor. November 1.

Lawson. Very upright and straggling, fruit very showy. quality poor. July 30.

Lawrence. Slow grower, hardy, fruit medium, green skin, somewhat rough, quality good. January and February.

PLUMS.

NOTES BY JOHN G. MITCHELL. (*Georgian Bay Fruit Station*)

AMERICAN PLUMS. Regarding these plums, I feel like passing a most sweeping condemnation on the whole list. Although some of them are of tolerable flavor, they are too small and unattractive in appearance to have any commercial value. The few baskets of them we ever shipped netted us nothing. Report sales read: "Wild plums not sold," and that was all we ever heard from them. The markets demand large and showy fruit, and we find there is no longer any use trying to grow anything but the best.

EUROPEAN PLUMS *Arch Duke.* This plum is proving everything we said or expected of it. Tree, a moderate grower, a regular annual bearer; fruit, large size; color, black, covered with a heavy blue bloom; flesh, yellow; parts freely from the stone. A good shipper, and presents a fine appearance in baskets.

Monarch. This is likely to be one of the best late commercial plums. Tree, a fairly good strong grower; fruit, large; color, dark, covered with a heavy bloom, suture, distinct; flesh, greenish yellow, parts freely from the stone; quality, very good when fully ripe; one of the best shipping plums Season, last of September. Very promising.

Saratoga. Almost identical with Lombard. Fruit seems a little longer than the average Lombard; suture rather more distinct.

Tatge. Same as Lombard, but does not average quite as large. Lombard is the more desirable of the two.

Czar. A very pretty, medium sized purple plum; flesh, yellow; stone almost free. One of the earliest varieties, ripening immediately after Red June, about middle of August; quality, good. Tree hardy and apparently productive.

Japan Plums. This season's crop once more proves the ability of these plums to stand our climate. Most of them appear to be as hardy as the best European. They are strikingly handsome, and some of them are enormously productive. The following are among the most desirable, as far as tested here :

Abundance. Well named. Bore very heavily this season. The tree is a strong, upright grower. The fruit is large and very beautiful ; color, yellow, or amber, overlaid on the sunny side with dots and splashes of red ; flesh, extremely juicy, with a peculiar sweet, delicious, mellow flavor ; too juicy for a good shipper. Ripe ten days before Lombard.

Burbank. One of the strongest, but the most spreading and sprawling grower in the plantation. Simply unequalled for productiveness. To produce the finest fruit, it should be severely thinned. The quality is fairly good, while its attractive color and good shipping qualities should recommend it as one of the best of the Japans. Ripe a week after Abundance.

Orient. A very handsome, symetrical grower and fairly vigorous. Fruit about as large as Burbank, and resembles that variety very much.

Red June. The earliest plum we have. Also one of the most desirable of the Japanese varieties. Tree, a strong grower, forming a large, well-shaped top, and bears the third year. Fruit, medium to large, conical in shape, bright red ; quality, good. Season, about August 1st. Very hardy.

Chabot. A very strong grower, of a large, beautiful, stately top. Bears the third year. Fruit, about same size and shape as Red June, but not quite so conical ; skin, amber, and nearly covered with red spots and markings ; very attractive. Late September. Very hardy.

Hale's Japan. A handsome, upright tree. Fruit, larger than medium ; color, yellow, well splashed with red, and covered with a most beautiful bloom, giving it a most attractive appearance. Rather a shy bearer, compared to other Japans, but best quality.

Although a good many of the Japanese plums are proving sufficiently hardy and of exceedingly attractive appearance, yet, as compared to our best European varieties, they are of such indifferent quality that we cannot advise the extensive planting of them. A few, however, could be planted to advantage. They would be a novelty, and, if judiciously selected, would more completely fill up or lengthen the season.

Notes by A. E. Sherrington. (*Lake Huron Fruit Station*)

Plums. There are now about forty varieties in this orchard and all are doing well, and making a strong and rapid growth. It is well fertilized, and kept well cultivated until the 1st of August. The pruning is done in early spring by thinning out any branches that are inclined to rub or cross each other, and all of the last season's growth are cut back from one-third to one-half per cent. and in some cases two-thirds. This system causes the trees to form a close compact head that will carry a crop of fruit without breaking ; it also has a tendency to harden the tree and cause it to come into bearing at an earlier date.

The *Japan* varieties are still proving themselves to be hardy and early bearers with the exception of *Wickson,* which is rather tender ; they are also very productive.

Abundance. Tree upright, spreading, vigorous and hardy ; fruit, large ; color, reddish purple ; quality, good ; yield per tree, ten baskets of twelve quarts ; date of blooming, May 9 ; ripe, August 27. Six years old.

Burbank Tree spreading, vigorous and hardy ; fruit, large, one and a half by one and three quarters ; color, red, resembles Abundance, but does not soften when ripe like Abundance ; quality, good ; bloomed May 9 ; yield, nine baskets ; ripe, September 5. Six years old.

Bradshaw. Tree not as vigorous as it might be ; it is a hard tree to start in orchard but does very well after established, upright, spreading ; fruit, very large ; color, purple; quality, good ; bloomed May 9 ; yield, one-half basket ; ripe, September 5 Four years.

Golden Drop. Tree strong, upright, spreading, vigorous and hardy ; fruit, large ; quality, medium ; color, yellow or light green ; bloomed May 11 ; yielded two baskets ; ripe October 1. Five years old.

Duane's Purple. Tree upright, spreading, vigorous and hardy ; fruit, large, one and three-quarters by one and three-quarters ; color, purple ; quality, good ; bloomed May 8 ; ripe September 5 ; yield, one basket per tree Six years old.

Field. Tree, an upright grower, vigorous and hardy ; fruit, large, one and a half by one and a half : color, purple ; quality, good ; bloomed May 11 ; ripe September 6 ; yield, one and a half baskets. Four years old.

Guii. Tree upright, spreading, vigorous and hardy ; fruit, large, one and five-eighths by one and five-eighths ; color, dark blue ; quality, best ; bloomed May 11 ; ripe September 5 ; yield, one and a half baskets per tree. Six years old.

Grand Duke. Tree upright, spreading, strong grower, hardy ; fruit, large, one and a half by two inches ; color, purple with a heavy bloom ; quality, good ; bloomed May 9 ; ripe October 1 ; yield one and a half baskets. Four years old. This is a valuable late plum.

Gold. Tree, rather poor grower of spreading habit, appears to be hardy ; fruit, small to medium ; color, yellow, turning red at maturity ; quality, rather poor ; bloomed May 15 ; ripe September 20. Three years old ; yield, two quarts.

Hale. Tree, vigorous, upright, spreading, not quite as hardy as Burbank or Abundance ; fruit, large, one and three-quarters by two inches, some two by two inches ; color, yellow ; quality of the best ; bloomed May 9 ; ripe August 27 ; yield, three and a half baskets. Four years old. This is a very promising variety.

Imperial Gage. Tree, upright, spreading, forming a compact head, vigorous and hardy ; fruit, medium ; color, yellow ; quality, best : full bloom May 11 ; ripe September 9 ; yield, two baskets. Six years old. One of the best light colored plums.

Lombard. Tree of spreading habit, vigorous and hardy, inclined to overbear itself, needs thinning to give best results ; fruit, medium ; bloomed May 9 ; ripe September 17; yield, six and a quarter baskets per tree. Six years old.

Monarch. Tree, upright, spreading, strong, vigorous grower, forming a round compact top, hardy ; fruit, large, one and seven-eighths by one and seven-eighths ; quality, good ; color, purple with a fine bloom ; bloomed May 8 ; ripe September 20 ; two and three-quarter baskets. Four years old.

Pond's Seedling. Tree, upright, spreading, vigorous grower, but not as hardy as it might be ; fruit, very large ; quality very good ; color, reddish purple ; bloomed May 16; ripe September 20, yield, half basket. Four years old ; subject to rot.

Purple Egg. Tree, a good vigorous grower and hardy ; fruit, large ; color, purple ; quality, good ; bloomed May 15 ; ripe September 15; yield, two baskets. Four years.

Quackenbos. Tree, upright to spreading, vigorous and hardy ; fruit, very large, one and three-quarters by one and five-eighths ; color, dark blue ; quality, good ; bloomed May 11 ; ripe September 9 ; yield, one and a half baskets. Six years old.

Red June. Tree, strong, upright, vigorous grower ; fruit, large, one and three-quarters by one and half ; color, dark red ; shape, oblong with sharp point ; saturam, distinct; quality, good ; pit, medium ; bloomed May 7 ; ripe August 15 ; yield, six quarts. Two years old ; a good keeper.

Spaulding. Tree, upright to spreading, vigorous and hardy ; quality, good ; flavor, very sweet ; fruit, medium size ; color, greenish yellow ; quality, good ; bloomed May 9; ripe September 6 ; yield, six baskets. Six years old.

Shipper's Pride. Tree, upright, strong, vigorous grower ; fruit, large ; color, purple; quality, very good ; bloomed May 16 ; ripe September 14 ; yield, two baskets per tree. Six years old.

Satsuma. A strong, vigorous grower, upright, spreading, hardy ; fruit, large, two by one and half inches ; color, dark red, when cut open it is about the color of a blood beet ; quality, first-class ; bloomed May 11 ; yield, two baskets per tree. Four years old. This promises to be one of the best of the Japan varieties.

Victoria. Tree, vigorous and hardy ; fruit, large, one and five-eighths by one and three-quarters ; color, yellowish, turning red or mottled when fully ripe, September 6 ; yield, six baskets. Rotted very badly or the yield would have been much greater.

Washington Tree, a good grower, hardy ; fruit, large and of the best quality ; bloomed May 10 ; ripe August 28 ; yield, four baskets. Ten years old. A fancy plum.

Wickson. An upright grower, forming a very close head, rather tender ; fruit, very large; color, red ; quality, very good ; bloomed May 11 ; ripe September 20. Five years old.

NOTES BY HAROLD JONES. (*St. Lawrence Fruit Station.*)

The plum orchard was plowed early in May and given clean cultivation, with frequent harrowing, to July 18th, when it was sown to red clover, which has made a good growth, and now gives a good covering over the entire ground.

All the trees came through the winter in good condition, and there were no losses excepting the Japan plum Kelsey.

Blossom buds of the following European varieties perished during the winter. Lombard, Communia, Tatge, Grand Duke, Hughes' seedling, Moore's Arctic, Saunders.

European plums in bloom : Shippers' Pride, Yellow Egg, Genii.

The following Japan blossom buds perished: Abundance, Burbank, Blood, Normands, Birkmans.

Japan plums in bloom : Gold, Maru, Ogon.

American plums in bloom : Wolf, Wyant, Forest Rose, Forest Garden, Hammer, Chas. Downing, Rockford, Whitaker, Col. Wilder, Milton, Weaver.

The trees were in bloom a few days earlier than in 1900, and we had no frost to injure the blossoms, but I did not have a single plum come to maturity. The continued wet, cool to cold weather through May injured the blossoms to such an extent that they turned yellow and fell off in all varieties.

The trees have made a good growth, but suffered from the attacks of shot hole fungi and aphis. In many cases the foliage began dropping early in September, principally on European varieties.

From my experience with plums during the last few years I believe they are much more sensitive to sudden changes of temperature, particularly the fruit buds, than either apples or pears.

The new additions to my plum list planted in the spring of 1901 are : "America," 3 trees from A. M. Smith ; "Emerald," 3 trees from E. D. Smith, and two trees each of plums, No. 53 and 54, very kindly sent me by Mr. Dunlop, Secretary of the Quebec Pomological Society.

These trees will likely prove to be a very valuable addition to my collection. I understand that these trees are known as Dunlop's seedlings, are of European origin, and are seedlings or suckers taken from trees in the priests' gardens on Mount Royal, where they have been grown and propagated for centuries and have become acclimated.

NOTES BY G. C. CASTON. (*Simcoe Fruit Station.*)

Of all the plums tested here, *Burbank* is far and away the best in point of profit. *Abundance* planted at the same time does not come anywhere near it. *Red June* has done well. It begins to bear almost as soon as planted, and bears every year ; the fruit is large and fine. Three trees planted in 1897 gave this year nine baskets of fine plums. *Ogon*, a large, handsome, yellow plum, is somewhat disappointing. It develops a very astringent flavor when canned. Probably this might be remedied by removing the skin, but few would take the trouble to do this when there are so many good plums. Most of the *Prunus Americana* varieties are very little better than our old natives. I am going to top work these with something better.

Shippers' Pride, *Middleburg* and *Monarch* fruited heavily this year. For an extremely late variety, the *Hudson River Yellow Egg* would fill the bill. I have one tree that was sent here in 1895 under that name, and it did not ripen this year until the 1st of October. *Willard* bore a good crop, but I have a poor opinion of its quality.

If I were confined to two varieties I would plant Red June and Burbank.

The choicest varieties for canning, out of some thirty varieties tested here, are *Peter's Yellow Gage* and *Prince's Yellow Gage*, but they are too tender for this section and lack in vigor. I am going to try them top grafted on something hardy.

NOTES BY M. PETTIT. (*Wentworth Station*).

Plums Forty eight varieties of plums have fruited at this station. The most profitable have been Bradshaw, Washington, Duane's Purple, Lombard, Yellow Egg, Grand Duke, Reine Claude, and Monarch.

Of the Japan varieties, Red June, Abundance and Burbank; Red June on account of earliness and high price; Abundance, and Burbank, on account of heavy crops. The only variety of no value is Caradus. Three trees were planted in 1894; have made good growth, and not yet produced a basket of fruit.

FERTILIZERS. Careful experiments have been made on apple, pear, and plum trees, and grape vines, with stable manure, ashes, the Thomas Fertilizer, and the Smith's Falls Fertilizer, with no results (compared with the soil where none has been applied) that would guarantee the profitable use of any of them on heavy land. The best results from any kind of fertilizer that I have seen are on the farm of W. M. Orr, Fruitland, where rye, rape, etc., have been plowed under for some years; the soil is in fine condition and the fine crops of fruit and wood growth plainly show the results.

RASPBERRIES.

NOTES BY A. E. SHERRINGTON. (*Lake Huron Fruit Station*)

RASPBERRIES: *Carpenter's Early Plant*, a rather weak grower and tender, fruit, small, quality only fair, color black, ripe July 12th, last picking July 20th, yield 2 lbs. 2 oz.

Brandywine. Plant a poor grower, weak in constitution, has just about died out, fruit small, quality very good, color red, ripe July 12th, yield 5 oz., not profitable.

Caroline. Plant, vigorous, healthy and hardy, fruit small, quality poor, very soft, color yellow, ripe July 16th, yield 3 lbs., not worthy of cultivation.

Conrath. Plant, strong, vigorous, healthy and hardy, fruit large, firm, and of good quality, color black, ripe July 16th, yield 6 lbs., 2 oz., one of the best blackcaps.

Cuthbert. Plant, a very vigorous grower, canes have grown this season to the height of seven feet, it is also hardy, although it was damaged somewhat last winter, it was owing to a late fall growth. Fruit large and firm, quality of the best, color dark red, ripe July 18th, last picking August 5th, yield 8 lbs. 8 oz.

Columbian Plant, vigorous, strong and healthy, but not hardy enough for a standard variety, fruit large, firm, quality good, color purple, ripe July 22nd, yield 6 lbs., not a good market berry on account of color.

Marlboro'. Plant strong, but of dwarfed nature, growth about thirty inches high, not as hardy as it ought to be, fruit large, fine, quality good, color bright red, ripe July 12th, yield 10 lbs., 2 ounces, a good market variety owing to its earliness.

Shaffer. Plant very vigorous, but tender; this berry is of the cap variety, propagates from the tip, fruit large, quality good for canning, color purple, ripe July 16th, yield 7 lbs.

Smith's Giant. Plant vigorous, a little tender but a very profitable variety, fruit very large, quality good, color black, ripe July 24th, yield seven pounds two ounces.

Souhegan. Plant fairly vigorous but tender, fruit large, quality very good, color black, ripe July 16th, yield four pounds five ounces.

BLACKBERRIES. The demand for this fruit is very limited, consequently it will never be a profitable crop for the fruit grower, and it seems to take several years to get the plants established; there are also a number of varieties that are not worth planting such as *Maxwell*, *Child's Tree Berry*, *Erie* and *Wachusetts*; those four varieties have been planted four years, but have never yielded a half pound of fruit yet.

Ancient Briton. Plant fairly vigorous, hardy and healthy, fruit medium size of rather poor quality, ripe Aug. 6th, last picking Aug 24th, yield four pounds five ounces.

Agawam. Plant a strong, vigorous grower, healthy and hardy, suckers sufficient to make a good row, fruit large, quality good, flavor agreeable, ripe Aug. 24th, last picking Sept. 1st, yield nine pounds five oz. This is one of the best.

Early Cluster. Plant a vigorous upright grower, but tender for this section, fruit large, quality good, flavor very good, ripe Aug. 12th, last picking Sept. 1st, yield six pounds seven oz.; instead of it being early I would say it is the latest one to ripen in the plot.

Erie. Plant rather poor grower, weak and tender; with the exception of a dozen berries on it, it has never yielded any fruit.

Eldorado. Plant a strong, vigorous grower, healthy and hardy, fruit large, quality good, flavor first class, ripe Aug. 1st, last picking Aug. 24th, yield ten pounds six ounces. This is a very profitable one.

Gainor. Plant a vigorous, strong grower and hardy, fruit very large, quality good, ripe Aug. 1st, last picking Aug. 24th, yield nine pounds three ounces. A very promising one.

Lucretia Dewberry. Plant of a trailing habit, will make as much as ten to twelve feet of a growth in a season, the way it is grown at this station is by letting the canes run along the ground as they please during the summer. In the spring the old canes are cut away and the new canes are trellised up on wires like a *Grape Vine*, in that way it is really ornamental when in bloom, also when loaded with fruit. Fruit large and quality very good, ripe Aug. 1st, Aug. 24th, yield eight lbs. five oz.

Maxwell. Plant a poor weak grower and tender, does not fruit here.

Ohmer. Plant strong, vigorous and hardy, fruit large, quality very good, ripe Aug. 1st, last picking Aug. 24th, yield seven lbs. five oz.

Synder. Plant strong and vigorous, healthy and hardy, fruit small to medium, rather firm, quality very good, ripe Aug. 1st, Aug. 15th, yield seven lbs.

Stone's Early. Plant vigorous, hardy and productive. The plants of this variety were affected with the *Red Rust*, those were dug up and burnt; this leaves only half the number of plants, consequently the yield is lower, fruit large, quality good, ripe Aug. 12th, last picking Aug. 15th, yield four lbs two oz.

Stone's Hardy. Plant fairly vigorous, healthy and hardy, fruit medium size, quality rather poor, ripe Aug. 12th, last picking Aug 24th.

Taylor. Plant strong and vigorous, healthy and hardy, fruit medium to large, quality very good, ripe Aug. 1st, last picking Aug. 26th, yield six lbs. two oz.

Western Triumph. Plant rather poor grower, weak and a little tender, fruit small, rather dry and hard, ripe Aug. 1st to Aug. 15th, yield six lbs twelve oz.

Wilson Junior. Plant a poor weak grower, rather tender, fruit large, fine quality, ripe Aug. 1st to Aug. 24th, yield five lbs. two oz.

STRAWBERRIES.

NOTES BY E. B. STEVENSON. (*Strawberry Sub-Station.*)

In this district the season was on the whole favorable; though opening with a very wet cold May, causing to some extent imperfect fertilization of the blossoms, some kinds suffered in this respect more than others, the Williams was particularly noticeable in this respect. At one or two pickings of the Williams a very large percentage of the berries were very imperfectly formed and not saleable. This long wet cold period was followed by some of the hottest days I ever remember, so hot that many pickers had to give up, during the middle of the day, overcome with the heat. Notwithstanding those drawbacks the crop was a good one and prices fair. I have been more than ever confirmed in my opinion as to narrow rows making the most profitable returns, for the grower. I am pleased to find that some of the large growers are following that method. One grower said to me only the last week that he was now well convinced that to plant the rows closer together say three feet apart, and let the rows grow to the width of fourteen or sixteen inches, cutting all other runners off, there was the most money in that way of growing strawberries; the fruit was larger and finer and more of it on the same space of ground, than with wide matted rows in which the pickers had to tramp on and smash many of the best berries.

This is the view I have held for years, and have advocated year after year in my report. I am satisfied that the grower who once gives it a fair trial will never pursue any

other method of growing strawberries. Let me repeat former instructions on this point; you know "line upon line and precept upon precept" is necessary in all lines of life. After the ground is thoroughly prepared, choose good, strong, healthy plants that have never fruited. Do not expose the roots to sun or wind. Never allow the roots to become dry; this is very important.

The plants carefully set just as soon as the ground is dry enough to work easily, then begin to cultivate. I would cut off all blossoms just as soon as they appear. There are many growers and nurserymen who advocate cutting the runners off also until the middle of July. I have found that by that time in our country we generally have a season of hot dry weather, in which the runners will not take root, unless they are set in; or a stone, or clod of earth, placed on them. The reason they give for removing the first runners is that it strengthens the parent plant. I grant that, but if your plant is what it ought to be when you set it out, viz., a strong, healthy plant, it is strong enough to go to work just as soon as it recovers the shock of removal, and this it does very soon, if it is transplanted as early as the ground will permit; it will very soon throw out several strong runners, that will in turn send out others, these well rooted; which they will be before the hot dry time comes on, and your ground in proper shape and heart; will go on growing all through the hot time, making fruit crowns and storing up strength to mature the crop of next season. When the row is sixteeen or eighteen inches wide, I would then cut off all runners. You will thus have with rows planted three feet apart—eighteen inches of plants which will be in a position to produce the finest fruit; and you will have eighteen inches of path for the pickers to use in picking, so they will not need to step on any of the fruit. It is gratifying to learn that some of the largest growers in this strawberry section are following this method, and finding it pays the best.

The crop was a good one considering all things, and lasted for about five and half weeks, from June 10th, where the first berries of the August Luther, were picked until July 15th, when the last of the Gandy and Hunn, Brandywine, Jersy Queen, and others, were picked ending the season.

The first ripe was the August Luther, on June 10th, followed by Michel and Van. Deman June 12th, Johnstons early, first ripe June 14th, followed by Senator Dunlop and Clyde on June 15th, we had showers on June 18th, and 19th, and a good soaking on morning of 20th, followed by great heat on 27th, 98° F., in the shade and continued for a week very hot.

The Miller, was ripe June 21st, followed on the 22nd by Williams, Saunders, Emperor, Empress; Brandywine on the 24th.

On July 3rd, first of Gandy ripe and still picking Senator Dunlop and Miller. Michel ended up on July 1st.

I have been particularly pleased with the showing of some of the new varieties viz., August Luther and Miller and Senator Dunlop.

There is quite a difference of opinion as to which is the earliest variety, the contest appears to be between August Luther, Michel, Excelsior and Johnston's Early. With me the August Luther was first ripe, I had it planted side by side with Michel and Johnston's Early, under same conditions, had only same care and attention on the same soil, when spring came, the Michel was in bloom three days before the August Luther; but when fruiting time came, the first ripe was August Luther, two days before the Michel, which came next. So that it would appear that it takes the August Luther several days less time to mature and ripen its fruit from blossom time than the Michel; that in my opinion is a distinct advantage for being in bloom two days behind the Michel, it may miss one of the late frosts that so often damages the Michel; and then ripen its fruit much earlier than the Michel under those conditions. This season there was a frost, a light one, but it did no injury to speak of to the early berries; it cut a flower or two in some places.

For those who desire fine fruit perhaps neither of these varieties would satisfy them. No doubt the only reason for growing them is the gain for one or two pickings of the high prices obtained for the first berries grown at home. These are followed so closely by Senator Dunlop, Clyde, Bubach and Haverland, that in some seasons there is very little difference in their time of ripening, but which in most soils are very much more profitable. It remains for each grower to try the varieties on his soil, and thus find out which is most profitable for him to grow. Now in many places the Michel is discarded as very unprofitable, while here in this section on some places it is very profitable, bearing a good crop

of very early berries. Following the instructions from the Board we have discarded many varieties that have been tested and proved useless, and thus cut our list of 250 down to one half, having now only some 120 in that plot, some of them new ones received last spring, as follows:

NEW ONES Bobolink, Blonde, Challenge, Carmi Beauty, Corsican, Hero, 11.59 P.M., Honest Charlie, Joe, Marie, Minute Man, Nellie, Robbie, Sampson, Monitor, Uncle Jim, Up to Date, Yant. Most of these have made a good growth; will be able to report on them fter fruiting.

EARLY AND EXTRA EARLY VARIETIES. August Luther, Michel, Van Deman, Johnston's Early, Excelsior, Smith's, Clyde, Marshall, Staples, Beder Wood, Lord Sheffield, Senator Dunlop.

SECOND EARLY TO MID-SEASON. Haverland, Bubach, Seaford, Miller, Tennessee, Prolific, Nick Ohmer, Sample, Ruby, Splendid, Glen Mary, Kansas.

Among the best of the late varieties are Aroma, Brandywine, Gandy, Hunn, Margaret, Saunders, Williams, Woolverton, Klondike, Jersey Queen.

No grower can go wrong in planting any of the above kinds as they have proved successful on most soils, with one or two exceptions.

I will now give a short description of each variety fruited the past season. Our soil here is a sandy loam, this is the first crop of strawberries grown on it. This also is important. Strawberries do not do well after being grown on the same ground for several years. Something has been taken out of the soil that they need. So that no variety will run as well on such ground, nor bear as much or as fine fruit.

Aroma. (Perfect.) A strong, healthy plant; good grower; ripens a little earlier than Gandy but picks longer covering a longer season. It disputes with Gandy the place of "best late variety."

Annie Laurie. (Perfect.) Good, strong, healthy plant; fruit, large, beautiful looking; finest quality; does not have enough berries to make profitable for market.

August Luther. (Perfect.) Is a healthy, vigorous grower, as much so as the Michels; plant is very productive; resembles the Michels, but larger, with a slight neck; ripens all over at once. One of the best extra early varieties if not the best. I would recommend all to give it a trial.

Bubach No 5. (Imperfect.) This old standard is still one of the best for the near market, the berries are so large and bright, and the plant very productive, but weakening somewhat; does not run as well as it did years ago.

Bennet. (Imperfect.). One of the newer sorts; did well; plant, healthy grower; good runner. Report fully after another trial.

Bismarck. (Perfect.) Plant, healthy; good grower; resembles its parent the Bubach; berry, large, round and bright, with golden seeds, and quite productive; a profitable sort.

Brandywine. (Perfect.) Plant, healthy; one of the strongest growers, in fact a rampant runner; the berry is large, dark color and firm; very good quality; will ship well; not quite as productive here as in some places.

Beder Wood. (Perfect.) Plant, strong, healthy; good runner; early to very early in time of ripening; quite productive; large; one of best very early kinds; a good pollenizer for early pistillates

Clyde (Perfect). Plant strong and healthy, a good grower; makes a good row; berry is very large and plant very productive; the best variety for a near market. It did very well the past season, is being largely planted; it is early, being ready to pick with the second or third picking of Michels

Clyde No. 800. (Perfect) This is a seedling of Clyde. Plant is healthy, good grower; berry is large, conical; firm, good quality and plant productive; a good variety.

Cobden Queen. (Perfect). A good, healthy grower; did well the past season.

Downing's Bride. (Imperfect). A good, strong, healthy grower, making plenty of plants; berry is large, good color, conical shape, is a bright, glossy berry, a beautiful berry to look at; worth a trial.

Earliest. (Perfect). A second Michel, cannot distinguish between them.

Excelsior. (Perfect). This variety has done well this year; it is healthy, good runner, making wide row. It has been very highly spoken of in some places as one extra early;

it is early and is worth a trial. It has not done as well with me as some of the other extra early kinds.

Emperor. (Perfect). This is a good grower; plant healthy, no rust, did well the past season; berry bright, sometimes a little irregular, large in size, fairly productive. For those who like large, fine fruit this is a good one.

Empress. (Perfect). Both this and Emperor are seedlings of the late John Little, and are evidently of the same parentage. This variety is very like the Emperor, somewhat darker in color; produces some large, fine fruit; a good one for amatuers, will give them satisfaction.

Geisler. (Perfect). This is a very early bloomer, would be a good one to fertilize the early pistillates; the plant is strong and healthy; the berry is large, good color, worth growing; did well this past season.

Gibson. (Perfect). Plant a strong one; a good runner, make a fine wide row; the berry is quite large, roundly conical, good quality; well worth trying, it is firm and I think would ship well.

Glen Mary. (Perfect). This has again proved to be a good one; plant very large, strong and vigorous, quite productive, berries large to very large, somewhat ribbed and green, seedy end. Not of best quality, but firm and will ship; profitable to grow.

Grenville. (Imperfect). Plant makes many runners, the leaves curl up somewhat, which some do not like, but that does not seem to interfere with its productiveness; good cropper; resembles its parent the Bubach, not as large though; it is a profitable variety to grow.

Gladstone. (Perfect). Plant very large and strong; good grower, healthy foliage; berry quite large, ripens mid season; it would appear to require a rich moist soil to do its best; worth a trial by those who have such.

Haverland (Imperfect). This is one of the standards, is still a vigorous grower; healthy plant and very productive; the berries are long, large, bright, fine looking in the basket, sells well; is one of the best. The Clyde is a good one to fertilize it with as they bloom at the same time.

Hunn. (Imperfect). A strong, vigorous grower; sometimes the plant rusts a good deal. It is very late in ripening its fruit, even later than the Gandy; the fruit is dark, roundish, firm and good quality; one of the very late kinds growers are looking for.

Jersey Queen. (Imperfect). Plant is healthy, fair runner, making plenty of plants; very late in ripening, one of the best late sorts. The fruit is large, round, bright color, firm, quality good; profitable for market.

Johnston's Early. (Perfect) A cross between Crescent and Hoffman; the plant is small, healthy, only fair runner on my soil; the berry bright red, not as sweet as August Luther but good, acid flavor, fairly productive; will give another trial.

Jerry Rusk. (Perfect). Plant healthy, stools out strong and healthy; berry is large, roundly conical, bright color, somewhat like its parent the Bubach; good flavor.

Klondike. (Perfect). Plant strong and good grower, but shows some rust; makes a fair row; it is a late variety and is worth a trial as such.

Lovett. (Perfect). Strong, healthy grower; foliage dark color, good runner; has a little rust sometimes; productive, berry conical; good color, bright, quality fair; does very well in some places; much like the Williams and Saunders. Of the three varieties I prefer the Saunders; they are all of the same season and a good deal alike in appearance.

Lee. (Perfect.) Plant, healthy, good runner; berry long, conical, acid, large, medium in produciveness, will give further trial.

Lord Sheffield. (Perfect.) An English variety, belongs to the very early sorts. Plant a good runner, makes many plants, but rusts somewhat; the fruit is round by coni-; bright red, good color, large, and plant quite productive; an early kind, well worth growing.

Margaret. (Perfect.) The plant is strong and a good grower, healthy, wants a good rich soil and will repay any such grower; berry, large and fine, quite productive, well worth growing.

Miller. (Perfect.) Plant, very large, strong and healthy, makes plenty of runners, which are very thick, no trace of rust on the plant; berry, large, conical, somewhat ribbed like Glen Mary, solid, quite firm; bright red in color; flavor slightly acid; large hull; season, medium to late. A good one, judging from one year's fruiting.

Marshall (Perfect.) This is one of the very large and early sorts that amateurs like to grow; it wants rich and moist soil to do well; not as profitable for market growing as Clyde and some others.

Michel. (Perfect.) This is so well known that I need not describe it. It is profitable in some soils on account of its earliness and is a good shipper. It suffers sometimes from late frosts. Some of the growers here say it pays them as well as any other kind.

Maximus. (Perfect.) Plant, large and healthy, good grower. The berry is large, but has not been productive enough to suit me so far. Will give it another trial.

Morgan's Favorite. (Perfect.) Plant is healthy, good grower, quite productive; berry, large, much shape of the Woolverton and same flavor, but firmer and not so dark in color; well worth a trial.

McKinley. (Perfect.) Plant, healthy, good grower, makes plenty of plants; berry, large, dark red, ribbed like the Glen Mary, medium in firmness, good flavor, fairly productive.

New York. (Perfect.) Plant large, strong, healthy one; a good grower, fair runner; berry, medium to large in size; mild flavor; well worth a trial.

Nick Ohmer. (Perfect.) Plant, healthy, strong and vigorous, good plant maker, that easily roots; berry is large, glossy, very firm and best quality; resembles in appearance the Sharpless; a good one; worth a trial by all.

Parson's Beauty. (Perfect.) A good, healthy plant, fair runner; berry, conical, bright red; yellow seeds, mildly acid, medium in firmness; quite productive; will be, I believe, a good market variety.

Pride of Cumberland. (Perfect.) Plant, healthy, good grower; makes fair row; medium in size; the berry is large and firm and quite productive, worth trying; a good, large, bright variety.

Pennell (Perfect.) A good one. Plant, healthy, good grower; berry, large, round, with a neck; good quality, firm, fine in quality; well worth trying.

Ruby. (Perfect.) Plant, good grower, but has some rust; quite productive; fruit, conical, large and quite firm and fine flavor; season medium; worth growing.

Rough Rider. (Perfect.) Plant, healthy, shoots out like Parker Earl, does not make many plants, productive, late; berry, large, somewhat irregular in shape, fair flavor; did not do as well as I expected, might have been owing to the very hot weather at its fruiting time.

Smith's Seedling. (Perfect.) Plant, small, healthy, fair runner, extra early, picks with the Michel; berry, medium in size, fairly productive; a good, extra early variety; well worth a trial.

Saunders. (Perfect) This is one of the best market varieties for mid-season to late. Plant, strong, good grower, making lots of plants. In my opinion, it is better in every way than the Williams. It is a Canadian berry, grown by the late John Little. The berry is conical, large, bright, firm and good quality, much finer than the Williams. ripens all over better, is as good a shipper as the Williams.

Sunshine. (Imperfect.) Plant, somewhat like the Crescent, great grower; plant, healthy, late fruiting. It has done fairly well, but would like to see it fruit another year before deciding as to its qualities.

Salem. (Perfect) Plant, medium in size, healthy, good grower, makes good row; berry, roundish, medium to large in size, fair quality; will give another trial.

Seaford. (Imperfect.) Plant, a strong and healthy grower, making plenty of plants; the fruit is large and firm, bright, glossy red and best quality; plant is very productive; it is a good one for the market grower; season, ripens about time of Bubach, and is among the last to pick.

Senator Dunlop. (Perfect.) Plant of the Crescent type, rampant runner, healthy, quite productive; berry, conical, bright, glossy, dark red, yellow seeds; solid and firm; large green hull; berry is good quality; medium to large in size; it ripens with the Clyde. I believe it will be a very valuable market variety; would advise a trial of it by all growers.

Sharpless. (Perfect.) Well known; it did well with me; the fruit is firm and of best quality, but does not bear enough for the market grower.

Star. (Perfect.) Plant large, healthy, good runner ; it is a good one for amateurs to get ; very like the Sharpless.

Splendid. (Perfect.) Here is a good early large sort ; plant healthy, vigorous grower, making lots of plants ; berry is large, round, good color, firm ; very productive; a good market variety ; well worth a trial.

Fred Stahaline. (Imperfect.) Has some good points ; healthy, good runner ; berry, roundish ; fair quality ; lots of other better kinds.

Sample. (Imperfect.) Plant is healthy, good grower ; berry is large and bright ; rather soft and poor quality ; it is productive and well worth a trial.

Tennessee Prolific. (Perfect.) Here is another good market berry ; large cropper ; plant is healthy; makes lots of plants; quite productive ; berry, good size, bright red, firm; good reports of it wherever grown ; worth a trial.

Vera. (Imperfect.) Plant, crescent type ; healthy, good grower, free from rust, very productive ; berry, conical, fair size, bright red, firm and good flavor ; a good one.

Van Deman. (Perfect.) Plant, good grower ; has some rust but makes a good row, productive ; one of the earliest and runs through a long season ; best quality ; berry, large and firm ; a good early.

Warfield. (Imperfect.) Plant, small, good grower, making many plants, healthy and very productive when it has moisture enough to mature its load of fruit ; suffers from hot, dry weather.

Wm. Belt. (Perfect.) Plant, good grower, but sometimes rusts quite a lot, but makes plenty of plants ; the plant is productive ; berry is large, sometimes a little irregular, but bright red, fine looking, firm and good flavor ; it has done well with me, and is well worth trying.

Williams. (Perfect.) Well known ; a good market sort ; plant, good grower, but sometimes has rust on it ; berry, conical, has green tip, is firm and ships well ; grown largely in this section. In my opinion it is not as good as the Saunders.

Woolverton. (Perfect.) Plant, large and strong, a good grower, making a fine row, very healthy, no trace of rust on it ; blooms very early ; berry is very large, mild but pleasant flavor ; medium to late in season ; a good fancy variety.

The lists I have given above are in my opinion the choice of the kinds now before the public. To say which particular variety will suit best the different soils would be entirely out of the question. Each grower must determine that matter for himself. The past growing season has been very dry and hot here. I notice the plantations on new land have done very well. On plots where the ground has been in crops longer the stand of plants is thin, and in some of the rows have large vacant spots. Mine have done very well. I have been cutting off the runners for a couple of months, so as not to let the rows get too wide. I planted early and let all the runners root at first until my row was wide enough ; then I began to cut runners, and I have perfect rows for next season's fruiting, while some others who have pursued a different method have a very poor stand of plants with some rows having many vacancies.

ONTARIO'S FRUIT AWARDS AT THE PAN-AMERICAN.

Considering the season, our exhibt of fruit from the Fruit Stations of Ontario was an excellent one, and at the close a selection was forwarded to the Pan-American Exposition at Buffalo by the Secretary, where, under Mr. Orr's supervision, it was placed on the tables and duly labelled.

A silver medal was given this collection by the American Pomological Society ; and, later, another silver medal was awarded it by the Exposition.

Map showing relative situations of the Ontario Fruit Stations.

REPORT

OF THE

INSPECTOR OF SAN JOSÉ SCALE

1901.

(*PUBLISHED BY THE ONTARIO DEPARTMENT OF AGRICULTURE, TORONTO.*)

PRINTED BY ORDER OF

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TORONTO.

REPORT

OF THE

INSPECTOR OF SAN JOSE SCALE,

1901.

To the Hon. John Dryden, Minister of Agriculture:

Sir,—I have the honor to present to you herewith my report of some of the more important features of the San Jose Scale investigation of the present year, together with such comments, suggestions and recommendations as existing circumstances seem to require.

During the year very little inspecting was done. Most of the one hundred orchards in which the scale was found on newly planted nursery stock were re-examined and found to be in a very satisfactory condition. A re-examination of the nurseries, which was begun in September, is still in progress, but the larger ones, which include three-fourths of the nursery stock of the Province, are now completed. The work is necessarily slow, as but four men are employed, and only three regularly, as the extensive experiments we are making required the help of one of them on different occasions. This we consider most important work, as it is only by the distribution of infested nursery stock that the scale is likely to be scattered over the country. We hope by very close inspection and the careful fumigating that is being done to prevent this.

In Ohio and New York States nurseries are regularly inspected once a year. Our practice of examining closely every tree in every row of merchantable stock, has been adopted in New York, and all infested trees found are promptly destroyed. The State provides against the transportation of nursery stock not accompanied by a certificate of fumigation, and it is being generally done by the nurserymen.

A greater quantity of spraying material was procured this year than last. One hundred and twenty large barrels of crude petroleum and ninety-seven barrels of whale oil soap were distributed, and went into the hands of a greater number of growers, many of whom were supplied again this year, and have shown their appreciation of the deep interest you are taking in this work, by promptly paying their proportion of the cost, which was returned to the Provincial Treasurer and by him placed to the credit of your Department.

In compliance with your directions, a tour of the oil wells in Western Ontario was made in February last to ascertain the specific gravity of the product of the various oil fields, and if possible locate a domestic article which would be safe to use on fruit trees in combatting the San Jose Scale. To accomplish this proved an arduous and tedious task. More than one hundred tests were made, and sixteen samples of the lightest and cleanest grades were taken, which were subsequently re-tested at home in the presence of others, who agreed with me that the sample from Dutton of a little better than 39 degrees specific gravity would serve our purpose best. Arrangements were made with Mr. David Barr, manager for the new Standard Oil Company, to supply

our requirements. Mr. Barr was very obliging, and so interested in what we were doing that he submitted to considerable inconvenience to help us out. Mr. Jos. Healey remained there while the work was going on, procured barrels, saw them filled from particular wells, and shipped them to their destination.

To obviate the necessity for importing soap, to which objection had been made by the manufacturers, and also to encourage home production, and make soap always available to the orchardists, as you requested, the order was placed with Messrs. Ward and Arthur of Consecon, Prince Edward County. They had on hand a large quantity of whole fish oil from which the finer grades had not been extracted. The potash used was a high grade of first sorts, purchased in Montreal by myself. The soap was made under the supervision of Mr. Culp, who, from beginning to end, weighed the material into the kettles, and shipped the whole lot out before leaving. The proportion of oil and potash greatly exceeded those contained in the soap used the previous year, as shown by analysis.

APPLICATION OF MATERIAL.

Instructions were printed and sent to those who were supplied with material. Owing to the distribution being made late, and the great extent of territory covered, we could not visit them all, but as far as possible these were seen, and such further instructions and assistance given as seemed to be required.

Notwithstanding the pains that were taken to impress the people with the necessity of thorough and careful work in applying these remedies, much of the treating done last year was of an indifferent character, owing to the dangerous qualities of the scab not yet being properly appreciated, to the lack of help, of time and of suitable spraying appliances. For applying expensive material successfully against an insect so persistent and so difficult to reach as the San Jose Scale, a first-class spray pump is necessary, and under existing conditions it is disappointing to find how few really good machines are in use. Growers are also seriously handicapped by an almost entire absence of competent help, especially during this busy season.

Whale Oil Soap. Soap is an expensive material, and there has been a disposition to try to make it go too far, which was a serious mistake. Because whale oil soap applied late will not injure even peach trees, which are less resistive than other fruit trees, on account of its value as a fertilizer, and its being a general insecticide and fungicide, killing many species of insects that winter on the tree alive, and particularly on account of its value in controlling leaf curl, it will certainly pay to treat peach trees for the destruction of this pest with good whale oil soap when enough of it is used, and applied, so thoroughly that the scale on every part of the tree will be saturated. Always treat every tree in the orchard, and in cases of heavy encrustation make a second application before the first is quite dry. The first application is a good preparation for the second, which will penetrate the many layers of scale, and reach the living insects beneath on the wood. But it will not pay to treat only the badly infested trees, as before the season is over many of the others will be equally affected, or the trunks and base of the large limbs, or to spray the trees from one side only, or to use a mixture of less strength than that recommended, as some did. Soap offers no resistance to re-attack, and if many of the scales be left alive reproduction will be so rapid that the original condition of infestation is quickly restored. But where soap was used in sufficient strength and quantity the scale is now materially reduced from what it was at the beginning of the season, the trees are cleaned up and invigorated, leaf curl was controlled, and the fruit of better quality than that of untreated trees. Several instances of good results are reported from the use of a full strength solution of soap against New York plum scale. In the proportion of one-quarter of a pound to the gallon of water, it is much appreciated by gardeners for its benefits in invigorating plants and ridding them of destructive insects. In preparing soap wash we prefer to heat all of the water used, adding tne soap when the water is put over the fire. It will then dissolve as the water heats, and become thoroughly distributed and combined with

the mixture. It should not be used on peach trees before the frosts are over, as it will certainly kill the blossom buds if used before that time.

Crude Petroleum. Like soap, crude petroleum was applied in some cases with proper care, and in others with little regard for its effect on either the scale or the trees. Some used it undiluted, and considerably in excess of a quart to a tree of the size of a full-grown peach, as was recommended. The result was that some of the trees upon which it was used were seriously injured, particularly Japan plums and the egg varieties. When oil is used undiluted it apparently accumulates in the cavities to a greater extent than when water is used with it, the same quanitity of oil being more fatal to the tree than when applied diluted. Some of these partially treated orchards in which there is little advantage from the treatment furnish splendid evidence of the usefulness of this remedy, the scale, on the treated portions having been immediately killed. Crude oil applied in April remains fresh until late in the season, and protects the trees from reinfestation, so there is practically no live scale on these treated portions, while those untreated have become gray with encrustation, and in many instances are dead, or have dead parts. This condition is so conspicuous, and the line of demarcation between the treated and untreated so distinct that it is really startling, and at the same time very encouraging for the use of crude oil on all varieties that will withstand it. I have observed no trees which have been entirely freed from scale by the use of crude oil, but there are very fine results where it was used diluted to the proportion of 20 to 25 per cent. with water, and so carfully applied that the trees were lightly and completely covered. Instances of trees which were considerably infested last spring, and were treated in this way, on which a close examination is necessary to find live scale now, are not uncommon.

Some growers who took unusual pains with their treating last spring are disappointed at finding any live scale on their trees now, but they have expected too much. The scale will not be exterminated by a single operation, and perhaps never by spraying. A correct estimate of the advantage of the work may be had by comparing the present condition of trees that were treated with that of those which were similarly affected at the beginning of the season, and were not treated.

Crude petroleum, diluted as above, was used on apples, pears, plums, cherries, currants, etc., without any apparent injury to the trees, and with splendid results in killing the scale. When properly used on vigorous trees we know of no exception to this statement.

Crude petroleum was found useful in destroying lice on live stock. It is conveniently applied by spraying. One gentleman also reports complete success in banishing fleas from his premises.

EXPERIMENTAL WORK.

The experimental work at St. Catharines, comprising eleven tests, was again conducted in an orchard on Lake street, belonging to Mr. Archibald Buchanan.

Three kinds of soaps were used, viz., the fish oil soap made at Consecon by Messrs. Ward and Arthur, and supplied to the people; Good's Philadelphia whale oil soap, manufactured at Philadelphia, and sent on for this test, and a linseed oil soap, said to be especially strong in potash, manufactured by the Imperial Varnish and Color Company of Toronto.

These were used at full strength—2 1-2 pounds to the gallon—and applied liberally to three rows of full-grown peach trees, fifteen trees in each row, reaching across the orchard, so that all varieties there were treated alike, the last week in April.

The Consecon and Philadelphia soaps were about equally effective. The result from these in killing the scale was very pronounced. While it was not exterminated, the infestation was so reduced as to justify the conclusion that the San Jose Scale may be profitably controlled by first-class soap when judiciously applied. Less than 2 1-2 pounds to the Imperial gallon was proved ineffectual. The Toronto soap had less effect in killing the scale. The same result followed its use last year, and it would

seem either that linseed oil has not the qualities suitable for this work, or that the excess of potash neutralized its effect.

Trees treated in this experiment plainly showed that whale oil soap, apart from its value as an insecticide, is also a fungicide particularly active in the destruction of leaf curl. The trees being thus relieved from fungi and insect pests, and invigorated by the potash application, were made cleaner in appearance, had luxuriant foliage, and fruit larger and higher colored than that of untreated trees.

Crude Petroleum.

Ontario crude petroleum of 39 degrees specific gravity was tried in comparison with a lighter grade of 44 degrees obtained from Titusville, Pennsylvania. Fifteen large peach trees were treated with each of these oils, undiluted. It was the intention to use not more than one quart per tree, but with the finest nozzle we had it was found impossible to make so small a quantity properly cover a tree, and considerable more was used, with the result that every tree so treated was killed. The nozzle was as fine as any in common use, and recognizing the necessity for a smaller opening we have since prepared a series of much finer ones. The Vermorel nozzles usually supplied by manufacturers have openings ranging from 1-14th to 1-20th of an inch. The sizes which, with the assistance of Mr. B. S. Hicks, the obliging Burlington watchmaker, we have made are 1-25th, 1-33rd, 1-40th, 1-50th and 1-66th of an inch, as determined under the microscope, all of which will spray crude oil without clogging. The ordinary Vermorel discharges the material so freely it is impossible to handle it with sufficient rapidity to make a light application. With one of the smaller sizes a barrel of mixture cannot be emptied in a day, which makes it easily possible to cover a full-grown peach tree with even less than one quart of oil. I much prefer a fine nozzle for applying any mixture, especially if it be strong.

These oils were also tried diluted to 20 per cent. with water, on the same number of trees, with better ultimate results from the Ontario oil than from the American oil. The American oil apparently killed the scale just as well, but the superior resistive qualities of the Canadian having better protected the trees from re-attack accounts for their present advantage. The Canadian oil, however, proved slightly more injurious to these peach trees.

Crude Petroleum and Soap,

In our experiments this mixture was used in the proportion of 25 per cent. crude oil with 1 pound of soap added to each gallon of water, and applied to fifteen large peach trees, with no injury whatever to the trees and much less effect on the scale than was produced by 18 per cent. of oil with the same quantity of soap last year. Much better work in killing the scale was done with 10 to 15 per cent. of oil with water alone, but very small percentages are hard to control. The effect of soap in this mixture is to lessen the severity of the oil treatment. We attribute the great variation from the results obtained by the earlier test to the different quality of the oil which this year's soap contains, so affecting the crude petroleum that the larger quantity in this year's experiment had less effect than the proportions previously used. Oil treatment is cheap, it is also effective in killing the scale, and for these reasons it is desirable to ascertain some way of using it on peach trees with less risk.

Fumigation.

Fumigation with hydrocyanic acid gas was extensively tried, and has proved to be altogether the most reliable method for killing the scale. Over 300 trees were treated in April and others at intervals during the summer. It is extremely satisfactory in killing the scale, without in any way affecting the trees or even the buds. In summer the work must be performed at night, and with a somewhat less strength of gas, to avoid injuring the foliage. Most of this treating was done with 25-100 of a

gramme of cyanide of potash to the cubic foot of space enclosed, and the trees left exposed to the gas 45 minutes; but in some of the work during the summer 20-100 was used with apparently perfect results in killing the scale, the exposure being 35 minutes. Branches from these trees were sent to several experiment stations for examination, and the entomologists at these points have had no better success in finding live scale on them than we had ourselves. These trees were apparently clean, as no live scale has been found on them by anyone since they were treated, which is true of all of this work, except when fumigated trees were re-infested from outside. At St. Catharines the trees treated were surrounded by others badly affected, and became re-infected in the course of the summer. As this method of treating is somewhat expensive, and it affords no resistance to re-attack, it is especially desirable that there be no opportunity for re-infestation, which is most likely to occur from untreated trees in adjoining rows, if the work be done during the breeding season. That the scale is more susceptible when active than when dormant we think is beyond question, the poisonous gas being absorbed by inhalation, which in dormancy is slight. To obtain information of this matter Prof. Lowe of the Geneva, N.Y., Experiment Station, conducted a series of experiments extending from December last to June of the present year. In these tests Prof. Lowe used .18, .25, and .3 of a gramme per cubic foot enclosed and found that during low temperatures .25 of a gramme—the proportion commonly used in fumigating dormant nursery stock—with an exposure of 45 minutes did not affect the scale, and that .3 of a gramme with 45 minutes exposure used at the same time killed it; and, further, that .18 of a gramme, with 30 minutes exposure did perfect work in June. This corresponds with the results we obtained in September from .2 of a gramme exposed 35 minutes.

We have two sheet tents for use on large trees, one 24 feet square, made of heavy factory cotton, and the other 38 feet square, made of 8-ounce duck. We also have a box tent, having one side removable, 5 x 5 x 7 feet with a hood, six feet high and 18 inches at the top, supported by four rafters. The tents are all treated with boiled linseed oil. The box tent is a most convenient device for fumigating small trees of upright growth not more than thirteen feet in height, and by roping in the outer branches it will cover a tree of considerable size. The cost of the chemicals for this tent is 5 cents per charge. Besides the danger from reinfestation the tents which are expensive, have not been durable, and these are most serious drawbacks to fumigation in orchards. With tents more durable I consider this method entirely practicable for all isolated and valuable trees that may be conveniently covered with a tent. The time intervening between the scale regaining activity and breeding—say from April 1st to the middle of June—is most satisfactory in obviating the danger of re-infestation while the work is in progress.

Dr. Wm. Saunders of Ottawa suggests that steeping the cotton for one hour in a solution of 5 pounds of alum to the barrel of water, before treating with linseed oil in the usual way, might have the effect of preserving them.

Lime, Sulphur and Salt.

Lime, sulphur and salt, the popular California remedy, was tried, and gave very encouraging results both in killing the scale and cleaning up the trees under what are usually accepted as adverse weather conditions. Fifteen large peach trees were treated with the mixture in the proportion of 35 pounds of lime, 15 pounds of sulphur and 15 pounds of salt, with enough water to make 40 gallons of wash. This was boiled in an iron kettle three hours and the sulphur thoroughly incorporated. It was applied to the trees on the afternoon of the first day of May while yet very hot, and covered them completely. The spraying was finished in a light rain, which increased to a heavy rain, and continued all night and part of the next day. Five days fine weather followed, then four days rain, then six days fine, then two days rain, then one day fine, then two days rain, then one day fine, then eight days rain, which completed the wettest May I ever knew. It is generally believed the success of this treat-

ment in California is due to the absence of rainfall, and that in any case a couple of weeks of dry weather immediately following the application are indispensable to its success. This work was closely watched by the neighbors all the way through, and the concensus of opinion now is that there was an entire absence of leaf curl, the foliage was plentiful and well developed, the wood was cleaner, and the fruit larger, higher colored and more plentiful, than on adjoining trees. In this experiment as in the others the treated row reached across the orchard, and all varieties present were included.

The very promising indications from this St. Catharines work led to an extended inquiry as to what use had been made of this remedy. The replies are disappointing, and show distinctly that the favorite remedy which in many parts of California has superseded all others, has not received even so much as a fair trial in the East. It was tried experimentally last spring by Dr. Howard, Chief Entomologist at Washington, D.C., and by the growers in Burlington County, New Jersey, with, they report, unexpectedly good results. The experience with this mixture in the East is too limited to justify speaking very definitely about it, but as an all-round remedy, insecticide and fungicide, it promises so remarkably well that we shall be pleased indeed to have as many as will to join us in making further experiments next April and report results.

The proportions for this work may be varied to almost any extent. A good pump will spray two pounds of lime to the gallon of mixture, without clogging, and if the lime be good, and properly slacked, there will be no settlings in the barrel. In his experiment Dr. Howard used thirty pounds of lime, twenty pounds of sulphur and fifteen pounds of salt, in fifty imperial gallons of mixture, which with our lime makes a light covering. The proportions recommended from California are 35 pounds of lime, 15 pounds of sulphur, and 15 pounds of salt, in 50 imperial gallons of mixture. The California people suggest that a larger proportion of lime and sulphur than they use might be advantageous in the east, and that with them salt is not an essential. In our recent experiments to determine the respective qualities of grey and white lime, their behavior in the process of preparation, application to the trees and subsequent durability, we made a large number of tests, in some of which salt was omitted, ranging from 1-2 pound to two pounds of lime to the gallon of mixture. As far as we have gone white lime slakes stronger than the grey, but no difficulty was experienced in applying either. A wash containing only 1-2 a pound of lime to the gallon of mixture makes a very light covering indeed. The sulphur remains exposed, is readily wiped off by the finger, and would be likely to be removed by rain, or even a high wind. A wash having two pounds of lime to the gallon of mixture makes a covering so thick and heavy that it breaks and scales off when the trees are swayed by the wind. After numerous tests we have fixed upon 35 pounds of lime, 15 pounds of sulphur and 10 pounds of salt in 30 gallons of mixture as the proportions most likely to give satisfaction. This did not break up, and makes sufficient body to hold the sulphur beneath it in contact with the bark.

In California the cooking is mostly done by steam generated in furnaces for the purpose, and piped to barrels, which is much more convenient and economical than cooking in a kettle over a fire as we were obliged to do.

In preparing the mixture we used a large kettle, in which was placed about 15 gallons of water. to which the sulphur and salt were added and then brought to a boil, then the lime was thrown in, adding hot water from another kettle if necessary to prevent burning, when the lime was slacked we added still more hot water, boiled two to three hours, increased the quantity to 30 gallons, with hot water, and applied while hot.

With suitable cooking appliances the preparation of this mixture is not so serious an undertaking as it may appear. At no time will the mixture work as well as when perfectly fresh. Some inconvenience may be avoided by removing the screen from the bottom of the suction pipe of the pump.

MINERAL WATER.

The kindly interest shown by those who have suggested remedies is much appreciated by me, and we are glad to work out any suggestions that are promising and determine their usefulness by actual trial.

At the oil fields a large quantity of water strongly impregnated with sulphur, etc., is pumped from the wells with the crude oil and is going to waste continually. My attention was repeatedly directed to this as a probable remedy for the scale. Mr. J. H. Fairbanks of Petrolea, very kindly proposed sending us a quantity of this mineral water for experiment, which he did, free of charge. This was used in our experimental block, but unfortunately had no appreciable effect on the scale as the latter multiplied as rapidly as on untreated trees. As a fungicide its effect was very much better.

POISONING.

Alfred Boultby, M.D., of Waterford, suggested that by introducing poison into the trees the sap might take it up and the scale be killed by feeding on it, naming corrosive sublimate as a suitable agent. Cyanide of potash was also used in different orchards in all cases on trees that were considerably affected with scale. The poison had no effect whatever, as the trees became rapidly encrusted.

PARASITES.

As referred to in my last report, an attempt was made to introduce the parasite Alphelinus fuscipennis, which Prof. Johnson had spoken of as being active in the south. During the first week in May a large parcel of twigs, which had been cut from an orchard in Maryland, where it was known to be plentiful last year, were received. The twigs were infested with scale, which were supposed to contain the parasites. These twigs were promptly tied up in infested Ontario orchards. Down to the present time we have no trace of them. They may possibly develop at a later date. The mature insect somewhat resembles a male scale, but has four wings and is readily distinguished.

When examining specimens I have occasionally met with mites which may feed on the scale, but in no case were they sufficiently plentiful to have much effect.

The little black lady bird (Pentilla misella) is widely distributed, being present possibly in every orchard in the country, but I have not observed it abundant or at all in proportion with the scale except in a large orchard near Chatham. Here they were very plentiful indeed in October, and were feeding on the scale. It will be interesting to know how these have wintered, as they are said not to winter so successfully as the scale.

FURTHER EXPERIMENTS.

Not having had experience as to the injurious effects of crude petroleum to the foliage, on the 18th of June I treated apples, pears, plums, cherries and peaches in my own orchards. 20 per cent. of oil was used with water and the leaves showed the oil for two weeks. The apples and peaches suffered most, but in no case was there serious loss of foliage. A month later I sprayed five four-year-old fruiting peach trees, two with undiluted oil and three with oil diluted to 20 per cent. with water. The fruit in both cases being blackened with the oil. The trees treated with undiluted oil lost probably one-third of their foliage, and the others very little. When mature the fruit had no appearance, odor or flavor of oil, but was very fine. At this writing the fruit buds on these trees have not suffered any injury whatever. A fine Vermorel nozzle was used. I would not hesitate to apply crude petroleum lightly to badly infested trees in summer.

Mr. Albert Lockwood of Niagara township has a fine pear and plum orchard of 385 trees, in which scale was found on a few trees two years ago. This year every tree in the orchard was infested. A great many were encrusted and several had already succumbed to the attack. The pear trees bore an abundant crop this year, and noticing that it was not being harvested, was informed by the owner that the fruit was so badly disfigured by the scale he could find no market for it. An examination showed not only the truth of this assertion, but also that some of the trees were so closely occupied that the young scales for want of space were actually climbing over one another. It was clear that if nothing were done many of the trees would not survive the winter, and with the owner's consent we decided to treat the whole orchard, and if possible save it as an object lesson of what might be done. As many of the neighbors and leading men of the district as could be seen were invited to inspect it before the treating began. We trust that the interest shown at that time will be continued, and that those who visited the orchard will note closely the outcome of the work. Fifteen of the trees were fumigated, some of them with .25 of a gramme exposed 45 minutes and others with .2 of a gramme, exposed 35 minutes, with equally good results. No live scale has been found on any of these trees since the treating was done, except in one case in which the chemicals used had been in stock for a long time and which the chemist would not guarantee. This illustrates the necessity of using only fresh chemicals of full strength and purity. In this work the chemicals cost 5 cents per charge.

The remainder of the orchard was treated with twenty-five gallons of crude petroleum, diluted to 25 per cent. with water, about 1-2 pint and at a cost of 1-2 cent per tree for material. This was done with a fine Vermorel nozzle, and completed on the 27th of September. It was surprising how well so small a quantity of oil reached the wood through the foliage, which was at that time on some of the trees very dense. A fairly perfect application was made, and the result in killing the scale is, under the circumstances, highly satisfactory. The terrible drain upon the trees was stopped; very little scale escaping. We hope by another light application late in the spring to reduce the infestation to a very narrow limit indeed.

INCREASE AND SPREAD.

The question as to whether or not the San Jose Scale exists in Ontario is no longer raised, and the feeling of indifference which was so prominent early in the investigation is in the old centres of infestation now superseded by that of deep concern. Outside of these sections the scale has been found at very few new points, which speaks well for the early inspection. This is extremely encouraging, as many specimens of other scales which were mistaken for San Jose have been received from widely separated localities. Some of these localities were visited, the people seen, and informed of its habits and appearance on the tree, which in every instance was apparently much appreciated. By request of the growers several meetings were attended and the matter fully discussed, and from the interest shown at these meetings and elsewhere, by growers from distant points visiting the infested sections for information, and in various other ways, we think if the genuine San Jose had been found outside of these it would have been reported.

Dr. Fletcher of Ottawa, who is a close student of insects affecting the interests of agriculturists, made a tour with me through some of the worst infested sections, and expressed much surprise at the progress the scale had made, and at the apathy of some of the people with such splendid evidence before them of the usefulness of the remedies.

In the original infestations—the districts in which the scale was first located—the increase and distribution was greater than ever before, and much greater than we had previously thought possible. The area of these infested sections is continually increasing, by the scale quietly reaching out by its own natural methods of distribution. It is impossible to account for the wonderful increase of scale in some orchards, and comparatively little in others. When no intelligent effort was made

to control the pest the conditions prevailing in these sections afford good reason for alarm. Orchards in which only a few trees were infested last year have the scale on every tree this year, and many of those which were considerably infested last year are now grey with it. The evidence of its destructiveness promised in last year's report is now conspicuous in all sections where it had become established. Fruit trees of all kinds have died from the attack, not only peaches but plums, pears, and even apples which were supposed to be too resistive to be seriously affected by the scale. The spectacle of large and otherwise thrifty orchards comprising hundreds of trees wholly devastated by the scale, already exists in Ontario. Peach orchards which bore a full crop in 1900, though badly affected then, but not noticeably weakened and which bore some fruit this year, are now practically dead. The scale became so plentiful in September the trees could not withstand the drain, and some apple orchards are in little better condition, especially blocks of greenings.

That the San Jose scale has remarkable reproductive ability was exemplified by its marvellous fertility during last September and October, which in some instances was incomprehensible, and beyond description. It has also the quality of spreading very rapidly through a fruit section, and if it becomes plentiful on only one tree in an orchard, and distributes, it is impossible to determine to what limit is has gone. Anything which moves may carry it, but in my judgment the wind is responsible to a greater degree than any other agent for its rapid dissemination, especially from trees that are already so occupied with scale there remains no opportunity to fix, in which the creeping larvae, having accumulated, are caught up by violent gales and scattered far and wide. No infestation should be allowed to reach this condition, but if it does occur there should be no delay in destroying such trees or in treating them, if there be sufficient vigor left to warrant treating. Under no circumstances should such trees be left a menace to the surroundings.

OBSERVATIONS IN OHIO.

At the middle of September I was honored with a visit from Prof. F. M. Webster, the Ohio State Entomologist, who came with his wife and remained nearly a week at my home at Burlington. This was an opportunity for me which I appreciated and fully improved. We visited different sections of the country, and had long talks about the scale and the best practice in dealing with it. His visit terminated with an urgent request that I should go with him over his elaborate work in Ohio and assist in determining the issue. This was a splendid chance for getting definite particulars already worked out, so accordingly, with your approval, the evening of October 21st found me at Painesville. Dr. Fletcher of Ottawa, our Dominion Entomologist, met me at Buffalo, and next morning we were joined by Prof. Webster and Prof. Forbes, State Entomologist of Illinois, who arrived late, and by two of Prof. Webster's assistants, who remained with us throughout the trip, explained the original conditions of the localities visited, and what had been done, which enabled us better to determine what had been accomplished.

The first point visited was Mentor, a few miles west of Painesville, where there is an infestation of considerable extent, including the Garfield estate, the home of the martyred President. We next went to Lakeside, then to Catawba Island and then to Toledo, at the extreme west end of Lake Erie.

In his very extensive work in Ohio Prof. Webster used only whale oil soap, and recommended it. The State took no responsibility where crude petroleum was used. A soap mixture of full strength was applied very liberally, which is the only way soap can be used effectively. The growers treated a large area themselves, and infested orchards that were not sprayed by the owners were treated by the State, and the expense charged against the land. Some very fine results were obtained, especially from the work done by the State. One splendid effect of this universal treating is to have almost entirely prevented spreading, for there is very little distribution from trees on which the infestation had been well reduced by treatment. Many of the growers at Catawba Island and about Lakeside are using crude petroleum. Some

use light oil and others heavy oil diluted and undiluted on their peach trees with results which they considered satisfactory. In most cases the oil was applied with such exquisite care that little injury to the trees followed, and the scale is well controlled. Mr. J. K. Southard of Lakeside has again had splendid success in keeping the infestation on his peach trees well below the danger point, with 15 per cent. or less of crude petroleum. Mr. Southard's spraying was singularly well done, and the results are very encouraging indeed.

I notice that where the best work was done the nozzles used had smaller openings than those in common use here. In some cases, however, peach trees got too much oil and suffered seriously, and there is danger that the success of this year's work may induce less care, and that the treating done next spring may be even more disastrous. In the principal infested sections in Ohio the growers are becoming very much interested in controlling the San Jose Scale. Their efforts this year were so successful that they are encouraged, and declare their intention to continue the fight with increased energy. They say they can and will keep the scale in check.

The lessons learned in Ohio were chiefly corroborative, but extremely useful in establishing previous conclusions.

Recent letters from New Jersey tell of good success in controlling the pest there. Mr. Horace Roberts of Moorestown writes that he used crude petroleum in the spring, and whale oil soap during the summer, with such success in his orchards, of 20,000 trees, that he will not lose over 50 trees this year from all causes. Mr. Roberts has every confidence in being able to control the scale, and will increase his orchards by 70 acres next spring.

The San Jose Scale is the San Jose Scale wherever it is met. In Ohio, New Jersey, Maryland, and other places where I have seen it abroad, it is just the same as in Ontario, and its behavior under treatment and that of the trees are identical with ours. Specimens of infested branches cut from Ontario orchards and sent to Washington, D.C., and compared under the microscope with specimens from New Jersey, Maryland and Georgia showed no difference in the thickness of the cover scale. The only difference reported from this examination was that on the specimens from points furthest north the cover scale was somewhat more closely attached to the wood.

PREPARATION OF TREES.

The conditions which are already fully explained clearly show the necessity for immediate action on the part of the growers, many of whom are disposed to put up a strong fight.

To successfully combat a pest so subtle and having such wonderful power of reproduction as the San Jose scale, it is indispensable that every advantage be secured. One essential which so far has not generally been attended to by a good many of those who have sprayed is the proper preparation of the trees by relieving them of all of the top which can well be spared both by thinning and cutting back, and by carefully scraping from the trunks and large limbs all loose bark and moss. The larvae have such a habit of hiding and of getting under the outer bark and into the deep cracks where the bark is more tender, that it is of first importance that everything which would prevent the spray reaching them should be removed. In instances where this was carefully attended to, the proportion of scale remaining alive after treatment is very much reduced. Much more satisfactory work in killing the scale is done on young, smooth-barked trees than on those which are older, and the smoother we make old trees before treatment the better will be the result. The sprays kill only by contact, and if the scale be killed it must be hit.

PUMPS.

The machine with which the sprays are applied should be perfect, or as nearly so as it is possible to have it. Most of the old contraptions upon which reliance is placed are disappointing in the extreme, and there is nothing more frequently re-

sponsible for the sudden discontinuance of work, when the job is only partly done, than a broken or balky pump.

A reliable up-to-date pump is indispensable. The best is the cheapest. It should be made of good material, of brass, or at least brass working parts, which fit. The discharge pipe should be provided with a stopcock to return the mixture to the barrel when it is necessary to relieve the pressure. The hose should be heavy enough to prevent doubling upon itself, and to give sufficient pressure without danger of bursting, and at least 15 feet long, to allow the operator privilege in reaching every part of the tree. The extension pipe should be in sections, say 15, 30 and 60 inches, joined with couplings. This will furnish seven convenient lengths, 15, 30, 45, 60, 75, 90 and 105 inches. Every extension pipe should be provided with a stopcock, and there is great advantage in using a pipe not longer than is necessary for the work in hand. Fifteen inches is enough for currants, gooseberries, etc. Last spring two of my men sprayed 30,000 in a week with one pump and two lines of hose. One drove the horse and sprayed, the other pumped and sprayed and the shortness of the pipe enabled them to control it readily with one hand. A fine Vermorel nozzle is preferable for applying any mixture, and if the mixture be strong it enables the operator better to control the quantity, makes a more perfect covering, and saves material. These very fine nozzles are now supplied by manufacturers. The nozzles may have either direct, oblique or lateral discharge, according to the work. An oblique discharge may be got by attaching an ordinary nozzle to a short piece of pipe, which had been bent to an angle of 45 degrees, and a lateral discharge by attaching an elbow and nipple to a straight pipe. The advantages of an indirect discharge in treating all sides of the limbs and every portion of the tree will be better understood when tried.

DRESS.

Much of the unpleasantness for the workmen and inconvenience in spraying arises from an incomplete or improper preparation in the matter of dress. Men who would not care to work in a rain without suitable covering are often improperly protected against the worse conditions of spraying. One of the most suitable coverings is a sailor's oilskin suit and sou'wester, which are light, impervious to wind and water, and not liable to crack. Head covering should be soft and extend in front to protect the eyes and behind to protect the neck. It is always desirable to protect the hands with rubber gloves. which should be in size quite too large.

MAINTAINING VIGOR.

Since it is only healthy, vigorous orchards—those in which attention has been given to the control of all insects and fungous diseases, pruning, fertilizing and proper cultivation that produce sufficient proportion of merchantable fruit to be really profitable—expenditure in this direction will be abundantly repaid.

Unlike the borers, which prefer weakened trees, the scale multiplies more rapidly on those which are vigorous, the food being more plentiful. But notwithstanding this quality the only means of furnishing an orchard with power to resist such an attack is by maintaining its vigor. Weakened trees are often only an encumbrance. They do not successfully resist either frost or treatment, and if infested by the scale quickly succumb. Peaches are less resistive than other fruit trees, and consequently especial pains should be taken to sustain them.

WHEN TO SPRAY.

I am not in favor of winter treatment. Insects are more susceptible and the trees more resistive in the spring after growth starts. Low temperatures seriously interfere with spraying, as neither the pumps nor material work so satisfactorily, and the discomfort attending the operation at this season usually results in an imperfect application. The time of the orchardist can be fully occupied with preparing the

trees and other work which may be advantageously done at this season, and the way cleared for doing the spraying at the most effective time, which one cannot afford to miss when using expensive remedies. A knowledge of the life history and habits of the insect to be operated upon will greatly assist in determining its most vulnerable season. The Red Plum Scale fixes and the Pear Psylla begins to lay eggs from the middle to the end of April, according to the weather condtiions which have prevailed, and should be destroyed before this takes place. The San Jose Scale and all other insects that winter on the trees alive, are more susceptible at the end of April, or as late as possible before the blossoms open, and because of their activity the trees are correspondingly more resistive than at an earlier date. Aphis and clover mite are not destroyed until the eggs are hatched, which is about the time the buds begin to open. Soap, even when recently used, will not prevent the scales from fixing, and if applied early will destroy the blossom buds. Crude petroleum, if used then, will remain fresh to a later date than if applied in winter, catch the larva from overwintered eggs and deter borers. Whether the treatment be with kerosene, whale oil soap, crude petroleum, a combination of these, or lime, sulphur and salt, I would treat Psylla and Lecanium early in April, and the San Jose Scale and trees not infested, as late as possible before the buds open. Summer treating should be done as early as it is practicable to do it. Apples should be treated first, pears next, then the hardier varieties of plums, then the more tender varieties and lastly peaches, allowing sufficient time to complete the work before the buds open.

I am much indebted to Mr. Robert Thompson of St. Catharines, Mr. J. Fred Smith of Glanford, and Mr. Jos. Healey and Mr. Wm. Weir of Niagara for their untiring assistance in carrying on the work of the present year, in providing, distributing and collecting for, the material, assisting the people in using it, and in conducting a series of experiments, some of which are so recent we cannot yet speak definitely of the results. We propose trying a larger number of experiments next spring, adding some that are, so far as we know, entirely new. By distributing the material earlier this year we hope to have more time to devote to the people during the spraying season.

CONCLUSIONS.

The developments of the present year show conclusively the necessity for immediate action on the part of the growers. The unprecedented multiplication of the scale and its disastrous effect upon the trees clearly demonstrate the consequences of neglect. The scale has been successfully controlled both at home and abroad. In Ohio the growers will continue the fight with increased energy, and in New Jersey, where the scale was first introduced into the east, they are so encouraged with their success in controlling it that large orchards are being planted. Here in Ontario we have splendid examples of the usefulness of the remedies. When these were properly applied neither the trees nor the fruit was injured, and the scale is not only held in check, but the infestation reduced much below what it was at the beginning of the season.

The success or failure of the remedies remains with the growers themselves. Careful work will be attended with success and indifferent work with disappointment.

In dealing with any kind of insects there is great advantage in being familiar with their life history. Growers should also study how they will be affected by the remedies; then use them at the proper time.

Under no circumstances should trees be allowed to become badly infested, as the scale is much more difficult to kill when encrustation occurs. There is little distribution from slightly infested trees, which furnish abundant opportunity to fix, or from trees that have been thoroughly treated, but on encrusted trees there is so little space remaining the young larvae soon accumulate and spread to adjoining trees. Badly infested trees are rapidly weakened, offering little resistance to either scale or treatment. Such should be treated during the summer and no tree ever allowed to become encrusted.

Infested scions should be carefully avoided and all buds and scions fumigated.

The quality of the material in all remedies is of the first importance. We have confidence in the quality and uniformity of the remedies supplied this year. In treating large orchards their respective cost is always a prominent factor. We have found in treating a tree of the size of a full-grown peach, the cost of material alone to be as follows:—Crude petroleum, 2 cents; lime, sulphur, and salt, 3 cents; whale oil soap, 9 to 12 cents; and fumigation, 15 to 18 cents.

In treating peach trees for scale the full proportion of 2 1-2 pounds of soap to the gallon of water should be used, and even 2½ pounds to the gallon of mixture is not too strong for badly infested trees. One pound to the gallon will effectually destroy leaf curl. Three-quarters of a pound and even one-half pound of this year's make of soap are reported to have been entirely successful in controlling this fungus, with splendid effect upon the trees and fruit. One-quarter of a pound was in some instances found almost too strong for the foliage. We would, however, recommend this quantity for use on trees in leaf.

The qualities which most successfully prevail against the efforts being made to control the scale are its wonderful fecundity and habit of spreading. Hence the necessity for reducing it as much as possible by very thorough work in treating.

Of the sprays used against the scale crude petroleum has proved the most effective, and it is cheap, and for these reasons we would recommend its use on all trees that will withstand it. We have in Ontario an excellent grade. When used in the proportion of 20 per cent. with water the tender varieties of plums were not injured. In no case should crude petroleum be used on peach trees that have been weakened from any cause. It is a strong remedy, and must never be applied in excess of what is necessary to penetrate encrustation. Every part of the tree must be reached, but the spray must not be directed too long against any part of it. Special attention should be given to the inside of the branches, the twigs and deep cracks in the bark, for at these points some scales frequently escape treatment. Tender trees have been killed by excessive applications. It is safer to use crude petroleum diluted to 20 or 25 per cent. with water and on peach trees to 15 per cent. which is effective, and must be applied with a combination emulsion pump. Peach trees do not withstand crude petroleum, except in very small quantities. I cannot recommend crude petroleum for general use on peach trees, and do not wish to be misunderstood.

There is no treatment so effective in killing the scale without injury to the trees as hydrocyanic acid gas. For valuable and isolated trees of moderate size I prefer this method. The cost of the tents and the danger from re-infestation are the principal objections to its use.

I would strongly urge the growers to try the California remedy, lime, sulphur, and salt. Its action in killing scale, destroying fungus and invigorating the trees has been with us very successful. It is safe to use on all kinds of trees, and is one of the cheapest remedies known. Any good spray pump will apply it when properly prepared and used while hot. We recommend 35 pounds of lime, 15 pounds of sulphur and 10 pounds of salt, in 30 gallons of mixture, as the most satisfactory proportions.

In using expensive remedies against so dangerous an enemy as the San Jose scale the growers should make it a point to secure every advantage. The trees should be prepared, suitable material, pump and dress provided, and the work done at the most effective time.

Large trees cannot be successfully sprayed from the ground. An elevated platform on the waggon with the pump, which will place one of the operators eight or ten feet up, is necessary.

If the fruit growers follow the recommendations indicated I have every confidence in the scale being controlled.

I remain, dear sir, yours very respectfully,

GEORGE E. FISHER.

Freeman, Dec. 31st, 1901.

INSTRUCTIONS FOR SPRAYING.

1. Trees must be thoroughly pruned, and all rough bark and lichen removed.

2. Have a sufficient supply of material on hand, and a proper pump for applying it.

3. Do not spray the trees when wet.

4. Thoroughness is imperative.

5. Soap can be used most effectively during the swelling of the buds; even if a few blossoms are open, no harm will ensue. An earlier application will destroy the fruit buds of tender trees. The trees should be sprayed until every part is saturated. The inside of the limbs, the twigs and crevices should have especial attention.

For work at this stage, soap should be used in the proportion of 2½ pounds to the gallon of water where the scale exists, and one pound to the gallon when operating only against fungus. It should be first dissolved in a separate vessel, then strained into the barrel of the pump, and is more effective when applied hot. One and one-half gallons of the mixture is necessary for a full grown peach tree. We prefer heating all of the water, and if the soap be added when the water is put over the fire it will be better distributed and combined with the mixture.

6. Any good force pump provided with an abundant supply of hose, an extension pipe and a suitable nozzle, will apply the soap.

7. If undiluted crude petroleum be used, the least possible quantity of oil that will cover every part of the tree should be applied with the very finest Vermorel nozzle. It is safer to use oil diluted to 20 to 25 per cent. with water. The Vermorel nozzle, either coarse or fine to suit the work, is best. While every part of the tree must be reached, no part should be covered twice with oil. A reliable combination pump only should be used in applying mechanical mixtures.

8. Treat for Lecanium and Pear Psylla early in April; for San Jose Scale and other purposes as late as possible before the beds open. First apple, then pear, then the hardier varieties of plums, then the tender varieties, and last, peach, allowing sufficient time to complete the work.

9. For summer spraying use kerosene, 10 per cent. with water, on bright, airy days, which will promote evaporation, or whale oil soap, one quarter pound to the gallon of water, whenever practicable.

For successful spraying a first class equipment is necessary. The valves should act promptly, and hold all they get. The hose should be heavy enough to give sufficient pressure without danger of bursting, and at least 15 feet long, to allow the operator privilege in reaching every part of the tree.

The extension pipe should be in sections, 15, 30 and 60 inches, joined with couplings. This will give seven convenient lengths, suitable for any work, and when all in use makes a pipe about nine feet long. Every extension pipe should be provided with a stopcock. The nozzle may have either direct, oblique or lateral discharge, according to the work in hand. An oblique discharge may be got by attaching an ordinary nozzle to a short piece of pipe which had been bent to an angle of 45 degrees, and a lateral discharge by attaching an elbow and nipple to a straight pipe. The advantages of indirect discharge in treating all sides of the limbs and every portion of the tree, will be better understood when tried. Try it.

REPORT

OF THE

INSPECTOR OF FUMIGATION APPLIANCES

1901.

(*PUBLISHED BY THE ONTARIO DEPARTMENT OF AGRICULTURE*)

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TORONTO.

REPORT

OF THE

INSPECTOR OF FUMIGATION APPLIANCES.

1901.

To the Honorable John Dryden, Minister of Agriculture:

Sir,—I beg to submit herewith my third annual report as Inspector of Appliances for the fumigation of Nursery Stock.

The fumigation system has now become well established in all our nurseries. Better fumigation houses are being erected, and greater attention is being paid to the process of fumigation than in previous years. I believe, moreover, that the great majority of nurserymen now realize that the enforced treatment of their nursery stock with hydrocyanic acid gas, although at present slightly troublesome and expensive, will eventually be money and time well spent. Already some of them boast of their superior equipment for fumigation, and advertise their stock as being thoroughly treated with hydrocyanic acid gas, so that buyers of their stock run no risk of introducing the San Jose Scale.

In view of the fact that the San Jose Scale, instead of being stamped out, has actually increased the past year, nurserymen cannot, for some time to come, expect that the regulations for the proper performance of fumigation of nursery stock will be less strictly enforced than formerly. As a matter of protection, I would urge that even greater precautions than ever be taken to have fumigation done properly at all the nurseries, for the nursery trade of this Province is at stake. Last spring Nova Scotia had an expert Inspector examine all imported nursery stock for San Jose Scale, and were live Scale to be found on any tree sent from Ontario, a prejudice would soon arise which would be almost fatal to our nursery trade with the Maritime Provinces.

British Columbia, too, is exerting her utmost care to have San Jose Scale excluded from her territory, and is enforcing a rigid examination of all imported stock. Our nurserymen, then, cannot be too careful of their shipments to these Provinces if they wish to retain their reputation.

Besides, our own fruit-growers are awakening to the fact that the San Jose Scale is no ordinary orchard pest, and are demanding protection from it in the purchase of new trees.

INSPECTION.

As in previous years, much attention was paid to the inspection of fumigation houses and boxes. In many cases permits were not granted until considerable repairs had been made and the houses made strictly air-tight. Every house was tested before permission was given to fumigate.

As already stated, good permanent houses are gradually superseding the temporary structures which were erected at first.

Too frequently, however, the owners of houses delayed making repairs until the arrival of the Inspector, and the result was the loss of considerable time occasioned by a second visit. Hereafter, the Inspector will not be so lenient, and will not make a second visit.

Notices were sent to every nurseryman intimating when he might expect a visit from the Inspector, and asking him to have his house in readiness for the test. In future the Inspector will warn by post the nurserymen at least a week prior to his visit, and will require that all repairs which were suggested at last visit, be made and that the house be ready for fumigation.

The main burden of the Inspection work fell upon Mr. W. N. Hutt, B.S.A., who has been my faithful assistant for the last two years. I cannot praise Mr. Hutt too highly, for he performed his work with great tact and firmness.

With the exception of the Eastern and some of the Niagara nurseries, which I myself inspected, most of the nurseries were inspected by Mr. Hutt. I at-

tended to the distribution of the chemicals from the Agricultural College, Guelph, and this is no slight burden at a busy season at the College.

More attention than ever will be given this coming year to the matter of proper fumigation, and efforts will be made to introduce the latest improvements, such as those suggested by Professors Sanderson and Penny, and described in a later section of this report.

The Hon. Minister of Agriculture for Canada gave us permission to inspect the Fumigation houses under his charge at Windsor and Niagara Falls.

An inspection was accordingly made, and after a few improvements had been effected the tests showed them to be reliable. These houses on the border are important, as all shipments of nursery stock from the United States must pass through them.

The Equipment for Fumigation

The equipment necessary for the fumigation of nursery stock consists of:

1. Chemicals, including water, sulphuric acid, and potassium cyanide (98-99 per cent pure).

2. Generator, or some suitable vessel, jar or crock, in which to mix the chemicals and generate the hydrocyanic acid gas.

3. A graduated glass beaker for measuring out the acid and water, and

4. Air-tight fumigation house, or box, to hold the stock while fumigation by gas is taking place.

The chemicals, with the exception of the water, are sent from the Agricultural College to the nurserymen in weighed and measured quantities, suited to the capacity of the fumigation houses or boxes. Great care should be taken with the chemicals, for the acid is deadly corrosive, and the cyanide is deadly poisonous. They should be kept out of the reach of children.

The generator may be a glazed earthenware crock or pickle jar, of 1 to 4 quarts capacity, according to the size of the house. After a charge of gas has been liberated a bluish liquid will be left in the generator, but will crystallize out as it cools. These contents are readily soluble in water, and should be emptied as soon as possible in a manure pile, but never in an exposed place. One nurseryman to my knowledge lost two good sheep by exposing the jars with the contents to these animals.

The generator should never be made of tin or iron; always use glass or earthenware, never the cyanide tins.

The Fumigation. As soon as the trees are dug and tied in bunches they are piled loosely on the floor of the house or box, with roots towards walls, and tops overlapping. When everything is ready, the water is measured out into the generator, then the acid is slowly poured into the water and kept stirred with a stick; finally the cyanide is dropped into the liquid from the tin or paper (as the directions state). The door, or lid, is immediately closed, and the room made perfectly air-tight. The doors are thrown open again in 45 minutes, and the buildings thoroughly ventilated for about 10 minutes.

It is very important that the roots of the trees be exposed for as short a time as possible, both before and after the fumigation process, for it is essential that they should remain moist. The roots, however, should not be puddled before fumigation.

Trees, especially peach, should never be fumigated a second time, nor should they be fumigated when they are drenching wet. Damp or moist trees, however, are not injured by the treatment.

Instructions sent to Nurserymen

The following circulars were issued during the year:

Memo for the Guide of Nurserymen in the Fumigation of Nursery Stock.

1. The formula to be used for apple, pear, plum, cherry, quince, shrubs and vines: Cyanide, twenty-five-twenty-eighths of an ounce; sulphuric acid, 1¼ fluid ounces; water, 1⅞ fluid ounces, for every 100 cubic feet in house or box.

2. The formula to be used for peach, Japan plum, raspberry, gooseberry, currant : Cyanide, ⅔ ounce; sulphuric acid, 1 fluid ounce; water, 1½ fluid ounces, for every 100 cubic feet in house or box.

3. The following plants do not require fumigation : Evergreens, strawberry plants, bulbs and tubers, herbaceous perennials and bedding plants.

4. Damage may be done to stock (a) if fumigation takes place too early in the fall, before the buds are set, and the wood sufficiently dormant, and (b) if fumigation takes place late in spring, after the buds have begun to swell.

5. The roots of stock should be exposed for as short a time as possible, both before and after fumigation. Experience shows that much injury has resulted from such exposures.

6. No nurseryman shall use chemicals other than those sent from the Agricultural College, Guelph, except by special permission of the Inspector.

7. Nurserymen should bear in mind that a certificate of fumigation must be attached to every package of nursery stock sent from the nursery.

8. No fumigation house is to be used for fumigation purposes until sanction has been obtained from the Inspector.

Regulations for the Fumigation of Nursery Stock.

The following regulations have been prescribed by order of the Lieutenant-Governor in Council, in accordance with the provisions of the San Jose Scale Amendment Act, passed April 1st, 1899.

1. Fumigation must be carried on in a box, room, compartment, or house, suitable for the purpose, which must be air-tight and capable of rapid ventilation. The owner or proprietor will notify the Minister as soon as preparation for fumigation is complete. The Minister will thereupon order an inspection of the fumigation appliances. No fumigation under the Act is to be carried on until such inspection has been made and a satisfactory report sent to the Minister.

2. The Inspector, after examining and measuring the box or house, or other compartment in which fumigation is to be carried on, will prescribe the amounts of material to be used for every fumigation, and the instructions as to the same must be carefully followed out. The Inspector may, if thought advisable, supply the material for each fumigation in weighed packages.

3. The fumigation house (which shall include all apparatus or appliances used in the fumigation, such as generators, etc.) is to be subject to the orders of the Minister on the recommendation of the Inspector. Subject to the approval of the Inspector, the fumigation house may be on other lots than those on which the nursery stock are growing.

4. The fumigation is to be by hydrocyanic acid gas, produced according to the instructions of the Inspector and from such formulas as he prescribes for the purpose.

5. The fumigation is to be continued for a period of not less than forty-five minutes. After the expiration of this time, or longer, and when fumigation is complete, the house is to be thoroughly ventilated for fifteen minutes at least.

6. No person is to be allowed to enter the fumigating house until after the ventilation period has expired. Entering before may prove injurious, if not fatal, as the gas is a deadly poison.

7. The fumigation of buds and scions may be done in fumigation boxes of not less than thirty cubic feet capacity, the same to be subject to inspection and approval.

8. Immediately after inspection of the fumigation house, the Inspector will report to the Minister, and the Minister or Inspector will thereupon give permission in writing for the owner or proprietor to begin fumigation.

9. The owner or proprietor of every nursery will attach to every box and to every package of nursery stock a certificate as follows, and he will furnish every purchaser who so desires a copy of the same.

Certificate of Fumigation.

This is to certify that this package of nursery stock, consisting of ....

....

....

was properly fumigated on or about the .... day of ...., 1901, in accordance with the regulations prescribed by order of the Lieutenant-Governor-in-Council, in accordance with 62nd Victoria, Chapter 35.

....

....

Portion of the San Jose Scale Act.

The following are the sections of the San Jose Scale Act dealing with the fumigation of nursery stock, 62nd Victoria, Chapter 35 :

3. No person shall import or bring, or cause to be imported or brought, into the Province of Ontario, for any purpose whatsoever, any plant infested with scale.

4. No person shall keep, or have, or offer for exchange or sale, any plant infested with scale.

5. The owner of proprietor of any nursery shall not send out, or permit any plant to be removed, from his nursery, without the same first being fumigated by hydrocyanic acid gas, in accordance with regulations prescribed by order of the Lieutenant-Governor-in-Council. 62 Vic., Chap. 35.

6. No person shall sell, or dispose of, or offer for sale, any plant obtained, taken or sent out from a nursery unless the said plant has previously been fumigated in accordance wtih these regulations. 62 Vic., Chap. 35.

7. In case the Inspector finds scale in any nursery and so reports to the Minister, the Minister may thereupon inform, by writing, the owner or proprietor or manager of said nursery of the existence of scale in his nursery, and the owner or proprietor or manager of said nursery shall not thereafter permit any plant or plants to be removed from the said nursery until the Inspector reports to the Minister that it is safe in the public interest to permit the said nursery stock to be removed after fumigation. 62 Vic., Chap. 35.

The Story of Fumigation by Hydrocyanic Acid Gas.

Fumigation in the Orchard:

The use of hydrocyanic acid gas as an insecticide dates from 1886. In that year Mr. D. W. Coquillet of the U.S. Department of Agriculture began experimenting against the scale insects of the California citrous orchards with carbon-bisulphide, arseniuretted hydrogen, and hydrocyanic acid gas. Of these three gases, only the last was found effective, and the others were discarded.

In the first experiment, the foliage as well as the insects suffered, but after a time, as the properties of the gas became better known, fumigation under tents became practicable.

In the first experiments unrefined potassium cyanide was used, and the results were very variable. Consequently it became necessary to use refined or pure cyanide to obtain uniformity in the results. It was at this time, too, that night fumigation was found to be the best for tent work, for sunlight decomposed the gas with the formation of other gases which injured the trees.

For some years the fumigation of orchard trees (chiefly orange, lemon, and allied plants) was confined to California, but in 1894 Mr. Coquillet applied the method in an orchard in Virginia.

In 1897 Prof. W. G. Johnson of the Maryland Agricultural College Experiment Station, started a series of experiments in the orchards on the fumigation of deciduous trees. The work was continued in 1898, and very valuable results were secured. For example, he determined the physiological effect of the gas on the trees, at different seasons, when there is a great difference in the functional activity of the trees, at different hours of the day when there is a varying amount of light, and with different strengths of the gas according to the amount of cyanide used: he determined the effect

of varying amounts of the gas on the San Jose Scale; and he determined to what extent fumigation was practicable in our deciduous orchards. Prof. Johnson showed that fumigation was virtually practicable only with small trees, and could not be expected to take the place of spraying in the case of large trees, although trees 15 to 17 feet high were successfully fumigated by means of his box-tents.

More recently Mr. V. H. Lowe of the New York Agricultural Experiment Station has been using in orchard work against the Scale a specially devised box-fumigator (Figs. 1, 2, 3). One side being removable, the box can be adjusted to a tree without much difficulty. It consists essentially of a frame covered with oiled 8-ounce duck, or heavy unbleached sheeting, which is sewed together in such a way that the

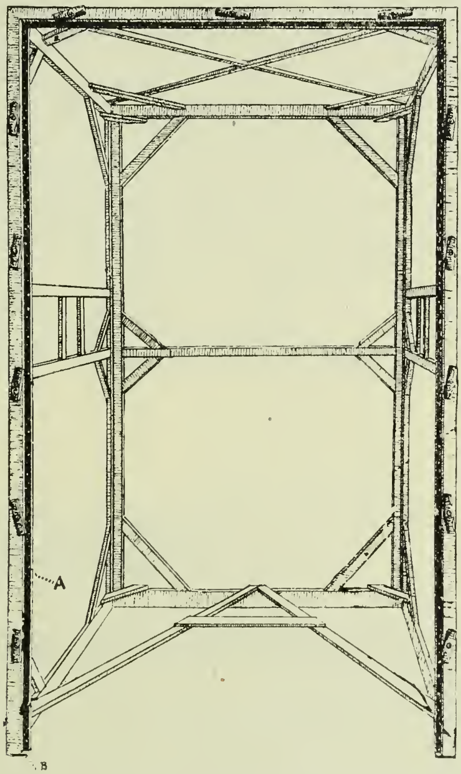

Fig. 1. Plan of Frame of Lowe's Fumigator.
(*Bull. 181 N. Y. Ag. Exp. St.*)

three sides were covered with one large sheet. The movable side of the fumigator is readily put on and taken off.

In a letter of January 31, 1902, Mr. Lowe states :—"Recently, however, we have made a decided improvement in the method of fastening the door. Instead of using buttons we have provided cross strips which extend across the door to the sides of the fumigator. The projecting ends are cut at an angle, and rest against corresponding surfaces of blocks fastened to the side strips of the fumigator. When the door is in place, and is being forced into position, the downward pressure brings it against the supporting sides, top and bottom of the fumigator."

Dr. E. P. Felt, New York State Entomologist at Albany, during 1900 made a large number of experiments in the orchard with tents similar to those used by Prof. Johnson.

Dr. Felt's tent consisted of a rectangular frame 6 x 6 x 8 feet, covered with 8-ounce duck, thoroughly oiled with boiled linseed oil, and a fixed pyramidal hood 7 feet high. The tent was lifted with a 30-foot pole and an 8-foot gaff, and dropped over

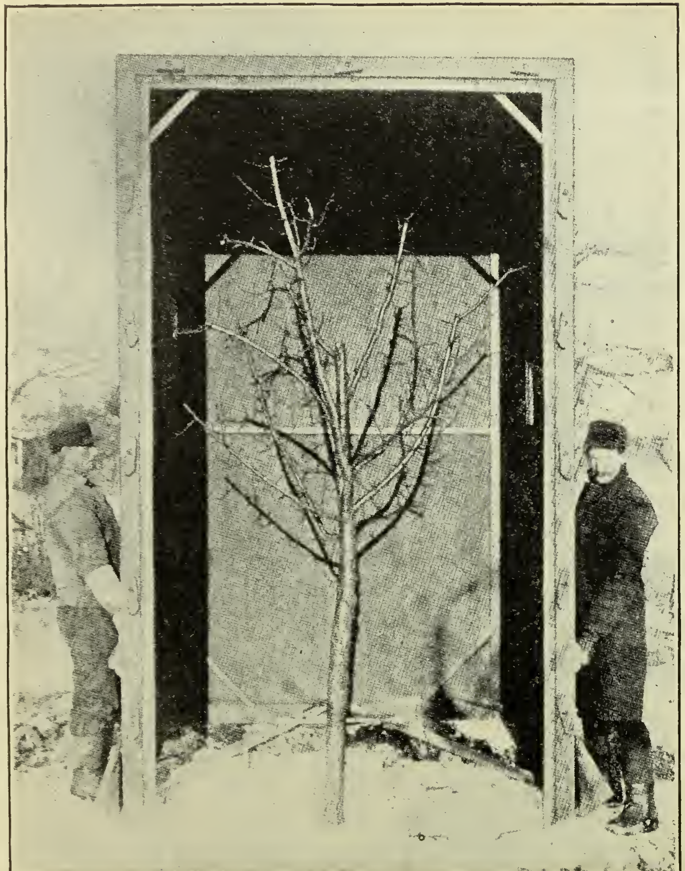

Fig. 2. Placing Lowe's Fumigator over a Tree.
(*Bull. 181 N. Y. Ag. Exp. St.*)

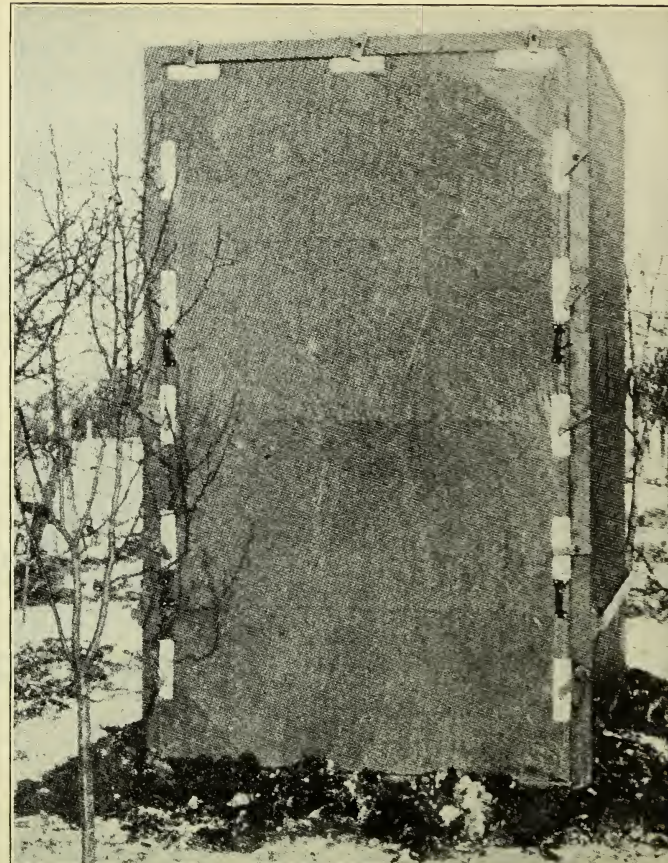

Fig. 3. Lowe's Fumigator in operation : showing dirt thrownabout base.
(*Bull. 181 N. Y. Exp. St.*)

the tree to be fumigated. Such a tent and apparatus for handling it cost $38.00, and Dr. Felt says that were it not for this excessive cost the system of fumigation in the orchard would be practicable. (Fig. 4.)

It is probable that this mode of fumigation will be used more extensively hereafter in treating peach trees and other small deciduous trees for the San Jose Scale.

Our own experiments in Ontario point to a growing usefulness of hydrocyanic acid gas in the orchard.

Fumigation in the Nursery :

To California belongs the credit of having first used hydrocyanic gas in the treatment of nursery stock, but to the Division of Vegetable Pathology and Physiology, Washington, belongs the credit of having first used it in the Eastern part of the Continent for the same purpose.

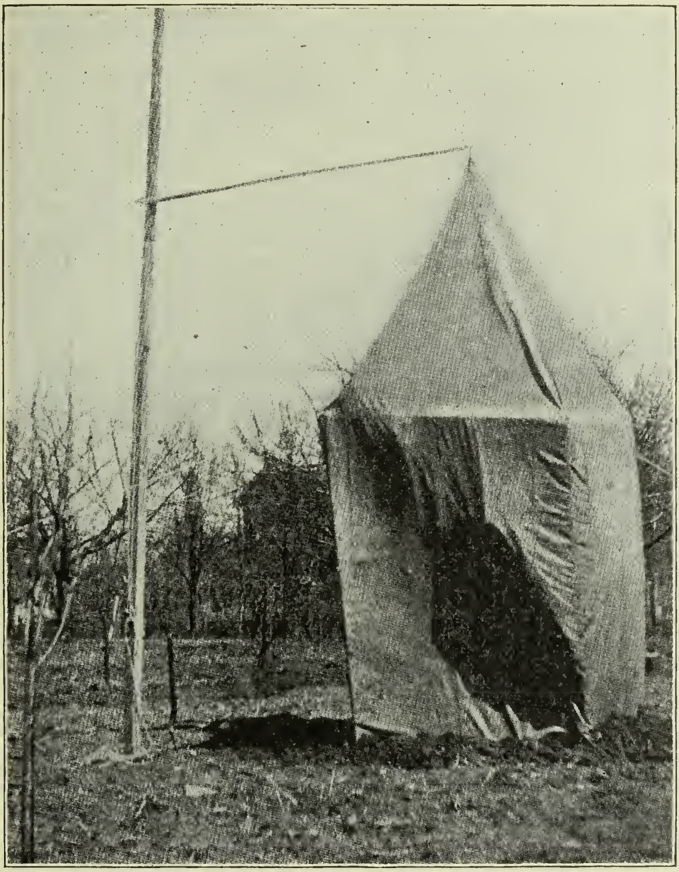

FIG. 4. FELT'S FUMIGATING TENT IN OPERATION.
(*After Felt Bull. 36 N. Y. State Museum.*)

After the preliminary experiments. Entomologists throughout the country were not slow to see the value of the great discovery, and a host of experimenters were soon at work seeking to determine all the conditions surrounding the problem of fumigation of nursery stock. Among the most prominent workers was Prof. W. G. Johnson, of Maryland, who had already done good service in working out the problem of orchard fumigation. He superintended the construction of fumigation houses in Maryland, when a law was passed making fumigation of nursery stock compulsory. These houses became patterns for those built later in other parts of the country.

As a result of Prof. Johnson's experiments we now know (1) the amount of cyanide potassium to use for each 100 cubic feet, and (2) the effects of the gas on various kinds of fruit trees.

To Prof. Webster of Ohio we are indebted particularly for the elaboration of perhaps the best method of liberating the gas in the house. He advised the use of slatted floors, the generation of the gas under the floor, and a special contrivance for dumping the cyanide into the acid and water in the generator. (Fig. 5 B.)

During the past year considerable attention has been paid to the question of diffusion of hydrocyanic acid gas within the fumigation house. In the early experiments, it was tacitly assumed that the gas diffused itself almost instantaneously throughout the house, but some doubts have been raised as to the correctness of this assumption, for two reasons: (1) The inter-diffusion of two gases like carbon-dioxide and hydrogen, differing greatly in weight, has been shown to be not instantaneous; and as the density of hydrocyanic gas is nearly the same as that of air it is very probable that the diffusion of these gases will be much slower; (2) The unequal effects of fumigation which have been occasionally observed in houses filled with stock.

This subject will, however, be discussed at greater length in a later section of this report.

Fumigation in the Greenhouse:

The value of hydrocyanic acid gas in greenhouses was first shown by Prof. Woods and Mr. Dorsett of the Division of Vegetable Pathology and Physiology, Washington, in 1895. Although the experiments of these gentlemen were entirely successful, yet the fact that it is unsafe to fumigate a greenhouse containing a mixed lot of plants, for some plants are more susceptible to injury than others, has had a deterring effect on the general adoption of the method.

Moreover, the same plants at different seasons and in different parts of the country do not always respond in the same way to fumigation by hydrocyanic acid gas.

By a little careful preliminary experimentation, however, it should be possible to treat greenhouses without danger to the plants.

Messrs. Woods and Dorsett in their bulletin (Circular No. 37) give a list of greenhouse plants with the corresponding amounts of cyanide which could be used with safety.

Fumigation of Flour Mills, Granaries, etc.:

To Prof. Johnson we are again indebted for the elaboration of a successful method for the fumigation of flour mills. The first test on a large scale was made by him in a three-storey brick mill in Pennsylvania in June, 1899, with the result that the weevil was practically exterminated. Later tests were made to kill the Mediterranean Flour Moth, with very gratifying results.

The same formula is used in mill work as in the nurseries, and the method of fumigation is simple. In mills of more than one storey, the upper storey should be treated first, then the next lower, etc., for the gas has a tendency to rise, and the operator has plenty of time to escape without danger from the gas.

Experiments conducted by myself two years ago revealed the fact that insects torpid with cold are not readily killed by hydrocyanic acid gas. In mills which are unheated, therefore, fumigation should be done during the summer months only, but if the temperature of the various parts of the mill is sufficiently high to allow the insects to breed uninterruptedly then fumigation may be done at any time.

The Chemistry of Fumigation.

The generation of hydrocyanic acid gas is a chemical operation, and for this reason the process is but partially understood by nurserymen unacquainted, as the most of them are, with chemical actions.

As I explained in my last report, the gas is liberated by the interaction of the sulphuric acid and the potassium cyanide. Another substance, potassium sulphate, is also formed at the same time in the generator, and the use of the water is to keep this substance in solution, and to prevent it coating over the potassium cyanide. In such a case further interaction of the acid and cyanide would be stopped. If no water were added, therefore, action would soon stop, and all the gas would not be liberated.

Moreover, the rapidity of evolution of the gas depends upon the degree of fineness of the cyanide used. When the cyanide is present in large lumps not so much of it comes into contact with the acid, and the chemical action keeps up for some considerable time; but if the cyanide is ground small, more of it is exposed to the acid at once, and the action is more intense but of shorter duration.

For example, I found when I used 9 fl. oz. of water, 14 fl. oz. of acid, and 6 oz. of cyanide composed of fragments 1 1-2 inches each way, the action lasted for nearly ten minutes; but when the cyanide was ground somewhat finely, the action lasted but three or four minutes. The same volume of gas, however, was liberated in each case.

Some nurserymen are of the opinion that but little gas is liberated when the cyanide is added to a cold mixture of acid and water. Such is not the case, for the same volume of gas will be evolved whether the solution is hot or cold. The action, however, will be less violent and will last much longer.

My attention was called in the autumn to the fact that one or two nurserymen used their cyanide tins as generators. It is needless for me to state that the use of such generators is contrary to the Regulations issued by the Department. The tins are soon eaten by the acid, but some acid is used up in doing so. Other gases—hydrogen and sulphur dioxide—are liberated, and a smaller amount of hydrocyanic acid gas than the normal is evolved. There is no better generator than the glazed earthenware crock, for it is both cheap and durable.

Injury to Stock.

Few reports were received during the past year regarding damage to stock by fumigation. In my last report I predicted that few complaints would be made, for I felt sure that the causes of the injury to peach stock in the two previous years were the severe winter conditions of 1898-99, and the method of handling the stock after it was dug—not the treatment received during fumigation. My own experiments and investigations, as well as those of competent authorities in the United States, were to my mind conclusive on this point.

During the course of my inspection, I frequently came across small shipments of nursery stock exposed carelessly at railroad stations to the changing conditions of early spring and late fall. I am convinced that sufficient injury is done to the roots of trees treated in that way that recovery after planting becomes impossible. I have frequently also seen agents selling trees in market places, where the roots were openly exposed for several hours. In such cases the roots become dried out, and death ensues.

A successful nurseryman of many years standing, to whom I mentioned the matter of the death of nursery stock, said that in ordinary years more trees died from a drying-out of the roots after digging than by any other way, and he was extremely careful to charge his agents to expose the roots for as short a time as possible, while handling the trees.

I desire here to impress upon our nurserymen the need for greater care in handling the stock. During the ordinary operations of fumigation and packing the the roots are twice exposed, once during the digging and fumigation and again before heeling in and packing.

It is just probable that the large mortality of trees shipped to Quebec and the Maritime Provinces is due to neglect and carelessness in the handling of the trees both by the nurserymen themselves and by their agents. Nurserymen, in their own

interests, should see to it in future that no complaints can possibly arise from this source.

On October 13th, 1900, I had sent me a consignment of nursery plum stock infested with Scale, for the purpose of determining the effects of hydrocyanic acid gas on both the trees and the Scale. For purposes of experiment, I divided the 41 trees into three lots, 12, 12, and 17 in each respectively. Lot I was fumigated with the usual formula, viz., 25-28 oz. cyanide, 1 1-2 fl. oz. sulphuric acid, and 2 oz. water per 100 cubic feet space for the usual time, 45 minutes, then was planted in the garden.

Lot II. was fumigated with the two-thirds normal dose, viz., 2-3 oz. cyanide, 1 fl. oz. sulphuric acid, and 1 1-2 fl. oz. water per 100 cubic feet for the normal time, and planted beside Lot I.

Lot III. was fumigated with double the normal dose. viz., 1 7-8 oz. cyanide, 2 3-4 oz. acid and 4 oz. water, for the normal time, and planted beside Lots I and II.

These trees were all examined carefully several times for living scale, once during the winter. and again in May, June and July; but no living scale could be found. Every tree survived and look thrifty and strong when they were last examined in July, just prior to their destruction.

These trees received no special care, beyond that their roots were exposed as little as possible. and were planted in the fall when conditions are perhaps not so favorable as they are in the spring, yet they came through all right without a single loss.

At my suggestion Mr. W. N. Hutt, Assistant Inspector, began a series of experiments in November, 1901, on many kinds of nursery stock—peaches, apples, plums, currants, roses and cherries. Various strengths of the gas were used, and untreated duplicates as checks were heeled in or planted like the others. The results of these experiments ought to be instructive and conclusive. as the stock was subjected to almost every condition possible in modern nursery practice.

The results, however, will not be known until the fall of 1902.

The Diffusion of Hydrocyanic Acid Gas in a Fumigation House.

In a previous section, I hinted that possibly hydrocyanic acid gas may not diffuse uniformly throughout a fumigation house; in other words, that it may be more dense in some parts than in others. This theory has actually been proposed to account for the unequal effects produced on nursery stock fumigated in the same house, which some nurserymen claim to have observed.

This question has been taken up by several experimenters during the past year. The results seem to show that little danger need be feared from the "banking" of gas in a fumigation house if the generator is placed under the floor and near the middle of the room. Although the gas on its liberation from a centrally placed generator does not spread instantaneously to all parts of the house, yet the distribution is extremely rapid, and the density of the gas becomes practically uniform throughout the house in a few minutes.

It is almost certain. however, that the gas does not diffuse as rapidly in a house filled with trees as in an empty one, for the close packing of the trees must naturally interfere with the rapid distribution of the gas. Prof. Woods of Washington tells me that the lateral diffusion of the gas was more than 25 feet in a minute in a large greenhouse which he was fumigating.

Professors Sanderson and Penny of the Delaware Agricultural Experiment Station, who have been doing excellent work on this problem of the diffusion of hyrocyanic acid gas in an enclosed space, report that in a box of 60 cubic feet capacity there is at first "an excess of gas around the generator. Within two minutes time this excess disappears, leaving only one-third of the normal quantity of gas near the generator, while 2 1-2 times the normal quantity is formed at the opposite end of the fumigating box. This excess rapidly diminishes and the gas increases in density around the generator, so that a tendency toward equilibrium is noted, although more than 20 minutes is required for the establishment of a perfect equilibrium."

In a large room of 4,332 cubic feet capacity Professors Sanderson and Penny determined the circulation of the gas to be as follows: The gas rises vertically from the generator, follows the ceiling, descends on the opposite side of the room and completes the circuit by returning to the generator.

They found that when the generator was placed in one corner of the room considerable time elapsed (30 to 60 minutes in their house of 4,332 cubic feet capacity) before the gas became evenly diffused, but when the generator was placed in the centre of the room diffusion was practically complete in 10 minutes. These results

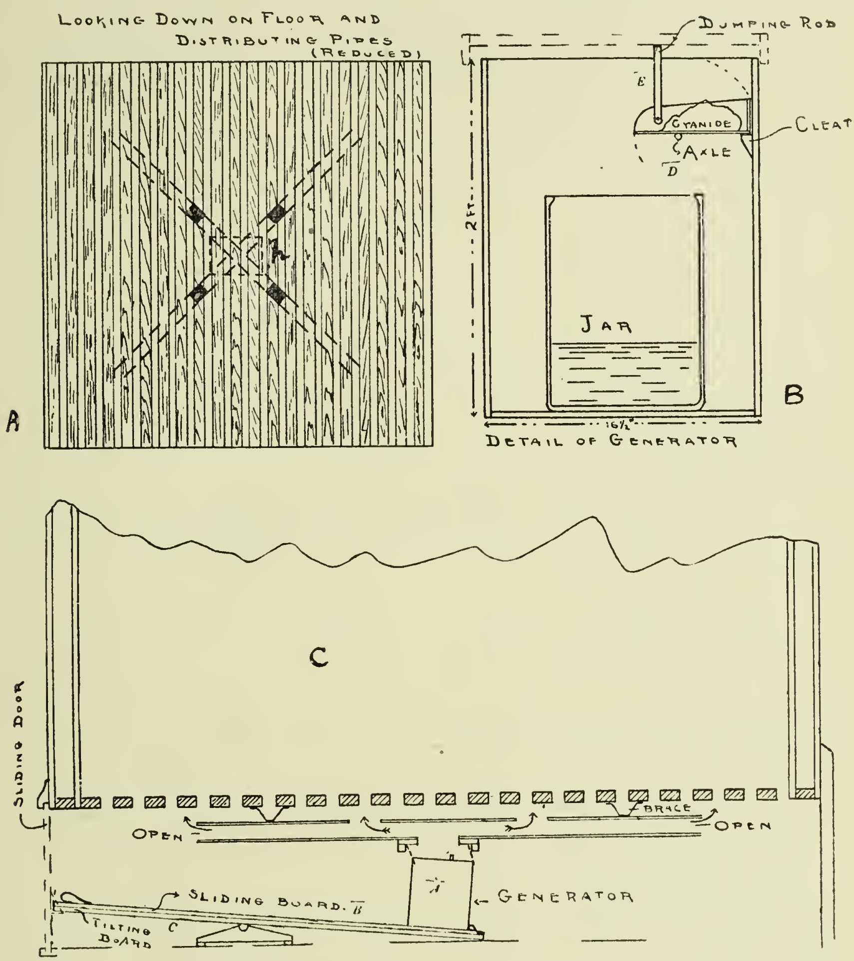

FIG. 5. Diagram of arrangement of Sanderson and Penny's Fumigation house.

A shows the distribution of the tubes attached to hood (h) on generator placed under the slat floor; B shows how the cyanide may be dumped into generator; C shows another view of the distribution of the tubes under the slat floor.

(*After Sanderson and Penny.*)

seemed to indicate that if the gas could be set free from several points instead of one diffusion would be much more rapidly completed. Messrs. Sanderson and Penny arranged over the generator a tin hood with four pipes leading away from it towards the corners of the room (Fig. 5) under a slat floor.

The same experimenters determined the absorbent effect of fresh soil. They found that in the case of a fumigation box resting on soil about 62 per cent. as much gas is available as in a closed box. They say: "It would seem necessary then, in

work of this sort over soil to use nearly twice as much cyanide and other reagents as if a closed box."

Professors Sanderson and Penny are to be congratulated on their valuable contributions to the difficult, and hitherto little known subject of diffusion of hydrocyanic acid gas in a closed space.

Professors Webster, Johnson, Woods and Waite also recommend the use of slat floors (Fig. 5 c.) for then the loose earth from the trees will not deposit upon the slats, and every part of the tree can be thoroughly fumigated. When there is considerable loose dirt upon the floor, and the trees are piled upon it, some of them are more or less buried. If the generator is placed under the slat floor there is not that impediment to the free distribution of the gas that there is when the gas is generated on the earth floor and at one end of the building.

General Recommendations.

Whereas the San Jose Scale is still with us in certain districts in alarming numbers, and threatens to spread to the nurseries in spite of special treatment with crude petroleum and whale-oil soaps; and whereas it is the opinion of the Inspectors that there are probably fruit-growers within the Province who do a small nursery business without our knowledge, I beg to recommend that.

1. The Inspector be allowed to appoint official fumigators to superintend the work of fumigation at the nurseries. Certain nurseries could be grouped together, and the fumigation controlled by a single man, thus lessening the expense.

II. All nurserymen be compelled to register with the Department of Agriculture every year, stating the nature of the stock which they are offering for sale.

It is quite probable that there are nurserymen doing business without the knowledge of the Department. It is but justice to those nurserymen who are honestly complying with the Regulations that they should be protected from the small grower who grows perhaps only one variety of stock and can put it on the market and underbid the regular nurseryman because he is relieved of the expense of fumigation.

Some Points that should be Remembered by Nurserymen.

1. Never allow a tree grown by you to get out of your nursery before it is fumigated.
2. Do not fumigate trees until the wood is well matured and the buds thoroughly dormant.
3. Never fumigate trees after the buds have begun to open in the spring.
4. Never expose the roots of trees longer than is absolutely necessary.
5. Send in your orders for chemicals early, and state clearly the number of doses of each formula required.
6. Never fumigate apples, pears, plums, quinces, etc., according to second formula
7. Repair your fumigation house early before the Inspector calls.
8. The Inspector will probably begin work about March 15th, and Sept. 15 in the Niagara region.
9. Never leave the cyanide or the acid where children can reach it.
10. Never allow the residue after fumigation to remain long in the crock or generator.
11. Never put a new charge in a generator containing the old residue.
12. Never use tin or iron vessels as generators, they will be rendered useless in a few minutes.
13. Never allow any one to enter a fumigation house under ten or fifteen minutes after the doors and ventilators are open.
14. Never omit to attach the certificate of fumigation to every parcel of stock shipped.

WM. LOCHHEAD,
Inspector of Fumigation Appliances.
O. A. C., Guelph.

A LIST OF THE NURSERIES OF ONTARIO, 1901

Morris, Stone & Wellington, Fonthill	Fumigation houses, 2,800 cub. feet.
Stone & Wellington. Toronto	do at M. S. & W.
E. P. Blackford & Co	do do
Pelham Nursery Co., Fonthill	do do
B. W. Secord, Fonthill	do house, 750 cub. feet.
J. E. Crow, Ridgeville	do house, 560 do
J. W. Page do	
H. A. McCoomb, Ridgeville	do at M. S. & W.
F. Walker, Virgil	do house, 866 cubic feet.
G. B. Wilson, do	
W. Lee & Son, do	do house, 2,100 cubic feet.
Angus Shaw, do	
Esau Hube, St. Davids	
E. Morden, Niagara Falls South	do box, 120 cubic feet.
Smith & Reed. St. Catharines	do house, 1,550 cubic feet.
A. G. Hull & Son, do	do do 960 do
Alex. Glass, do	do do 240 do
Neil Buchanan, do	
J. J. Collins, do	do do 460 do
Brown Bros. Co , Brown's Nurseries	do do 6,400 do
Chase Bros. Co., Colborne	do by Brown Bros. Co.
F. W. Bowman & Son Co., Toronto	do do
E. D. Smith, Winona	do house, 2,300 cubic feet and box.
R. R. Smith, do	Using E. D. Smith's.
Geo. Chambers, do	Fumigation house, 1,056 cubic feet.
C. P. Carpenter & Son, Winona	do do 1,318 do
W. F. Geddes, Winona	do by C. P. Carpenter & Son.
F. B Henry, do	do by E. D. Smith.
J. E. Henry, do	do by E. D. S. and C. P. C. & Son.
I. E. Vanduzer, do	
Winona Nursery Co., Winona	do in E. D. Smith's.
Brown Bros do	do do
Grimsby Nursery Co., Grimsby	do by C. P. Carpenter & Son.
W. Smith do	do by E. D. Smith.
W. A. Holton, Hamilton	do house, 640 cubic feet.
Webster Bros., do	do do 240 do
Haskins Wine Co. do	do do 642 do
Ward Bros., Bartonville	do by Haskins Wine Co.
J. W. Burns, Stoney Creek	
Brock Galbraith, do	do house. 320 cubic feet.
Fruitland Nursery Co., Fruitland	do and box, 1,620 and 70 cubic feet.
H. H. Hurd, Hamilton	do house, 1,700 cubic feet.
M. I. Davidson, Burlington	do by Hurd & Haskins.
S. T. Anderson, Waterdown	do by Hurd.
Cavers Co., Galt	do by Caldwell & Co.
Caldwell & Co., Galt	do house, 1,300 cubic feet.
H. L Janzen, Berlin	do box, 90 cubic feet.
M. Milgau, Bright	do house, 1,377 cubic feet.
E. Hersee, Woodstock	do do 630 do
A. W. Graham, St. Thomas	do do 62 do
H. L. McConnell, Grovesend	do do 160 do
C. A Baker. London	do do 510 do
D. Dempsey, Stratford	do do 100 do
J. McAinsh, Wellburn	do do 145 do ; box $52\frac{1}{2}$ c.ft.
Strathroy Nursery Co., Strathroy	do do 1,075 do
Estate of J. Stewart, Goderich	do do 300 do
J. W. Skinner, Mitchell	Evergreens.
Chas. Ellis, Meaford	Fumigation do 475 do
J. H. Wismer, Port Elgin	do do 900 do ; box 45 c. ft.
W. Fleming, Owen Sound	do do 500 do
S. H. Newman, do	do do 250 do
T. C. Robinson, do	Using S. H. Newman's house.
M. W Robinson, Kettleby	Fumigation house, 300 cubic feet.
Leslie Nurseries, Toronto	do do 1,760 do
Steele, Briggs Seed Co , Toronto	do do 75 do

W. Rennie & Sons, Toronto				
J. A. Simmers, do				
A. Gilchrist, Toronto Junction				
Manton Bros., Eglinton				
Mr. Hogg, Eglinton....................				
Granger Bros, Deer Park, Toronto				
Stanley Spillett, Nantyr				
R. Breckon, Toronto				
Colin McDonald, Toronto, 1,164 Queen St. East	Fumigation 305 cubic feet.			
W. L. Clarke. Leamington..............				
Thos. Rowley, do	do	box, 36 cubic feet.		
Geo. D. Ellis, do	do	216 "		
Dennis Smith, do				
E. E. Adams, do				
A. Fox & Son, do				
J. Mitchell, do				
S. Ward Kennedy, do				
C. B. Palmer, Kingsville................				
Geo. E. Jones, do				
B. Jasperson, do	Fumigation	box, 480 cubic feet.		
Geo. Cady, Ruthven	do	house.		
McKenzie, Ross & Sons, Chatham	do	do	75	cubic feet.
F. W. Wilson, Chatham................	do	do	1,325	do
N. E. Mallory, Guilds..................	do	do	144	do
N. T. Selby, Newcastle	do	do	560	do
R. J. Mackie, Oshawa..................	do	do	385	do
L. K. Shourds, Wellington	do	do	1,000	do
Wallace Woodrow, Picton	do	do	500	do
W. C. Reid, Belleville........	do	do	190	do
J. W. Johnston, Campbellford	do	do		
H. A. McIntosh, Dundela	do	do	72	do
Thos. Dangerfield, Kemptville	do	do	640	do
John Conn, do	do	do	640	do
W. J. Kerr, Renfrew	do	do	36	do
David Tait, Iron Bridge, Algoma	do	do		
Mr. Campbell, Simcoe..................				
Mr. Turner, Scotland				

THIRTY-SECOND ANNUAL REPORT

OF THE

ENTOMOLOGICAL SOCIETY

OF

ONTARIO

1901.

PUBLISHED BY THE ONTARIO DEPARTMENT OF AGRICULTURE, TORONTO.)

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THIRTY-SECOND ANNUAL REPORT

OF THE

ENTOMOLOGICAL SOCIETY OF ONTARIO,

1901.

To the Honorable John Dryden, Minister of Agriculture:

Sir,—I have the honor to present herewith the Thirty-Second Annual Report of the Entomological Society of Ontario.

The thirty-eighth annual meeting of the Society was held in London on the 13th and 14th of November, 1901, at which the members had the gratification of your presence and participation in the proceedings. During the sessions the officers for the ensuing year were elected; reports were presented by the various branches, sections and officers of the Society, including the audited financial statement of the Treasurer; and papers and addresses were given on a variety of entomological subjects, many of which are of great practical value.

The Society's monthly magazine, the *Canadian Entomologist*, has been regularly issued during the year and has now completed its thirty-third volume. Its circulation in all parts of the world continues to increase and its high scientific character has been ably maintained by a large number of contributors.

I have the honor to be, Sir,

Your obedient Servant,

Charles J. S. Bethune,
Editor.

London, Ontario.

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THE ENTOMOLOGICAL SOCIETY OF ONTARIO.

ANNUAL MEETING.

The thirty-eighth annual meeting of the Entomological Society of Ontario was held in London on Wednesday and Thursday, the 13th and 14th of November, 1901. The chair was occupied by the Rev. Dr. Fyles, of South Quebec, President. Among the members present were Dr. James Fletcher and Mr. Arthur Gibson, Central Experimental Farm, Ottawa ; Mr. Henry H. Lyman, Montreal ; Mr. John D. Evans, Trenton ; Prof. Lochhead, Ontario Agricultural College, Guelph ; Mr. Geo. E. Fisher, Inspector of Scale Insects, Freeman, Ont. ; Mr. Charles H. Young, Hurdman's Bridge, Ont. ; Prof. F. M. Webster, State Entomologist, Wooster, Ohio ; Revs. Canon Dann and Dr Bethune ; Drs. W. J. and H. A. Stevenson, Dr. Woolverton, Messrs. J. A. Balkwill, J. H. Bowman, J. Dearness, John Law, J. Alston Moffat, W. E. Saunders, R. W. Rennie, E. A. Brown, Demster, Thompson, Lochhead, and many other residents of London. The Society was also favored with the presence of the Hon. J. Dryden, Minister of Agriculture for Ontario, and Mr. G. C. Creelman Superintendent of the Farmers' Institutes of Ontario.

Letters expressing regret at their inability to attend were received from Directors, W. H. Harrington, Ottawa ; D. G. Cox, Toronto ; and James Johnston, Bartonville ; and from Messrs. E. M. Walker, Toronto ; A. F. Winn and Dwight Brainerd, Montreal.

The morning of Wednesday, November 13th, was taken up with a meeting of the Council for the transaction of the business of the Society and the preparation of their annual report. In the afternoon the Society met at 2.30 o'clock and at once proceeded to discuss the progress, present aspect and future outlook of the San José scale in Ontario The President, Dr. Fyles, expressed his gratification at the presence of so many eminent men at their meeting and felt assured that the conference they were entering upon would be of great value both to themselves and to all interested in fruit culture in this Province.

SAN JOSÉ SCALE DISCUSSION.

At the request of the President, Mr. George E. Fisher, of Freeman, Ont., the Provincial Inspector of Scale insects, opened the discussion. The following is a condensed summary of his address : I wish to state at the outset and to emphasize very strongly the fact that very few fresh localities have been found this year infested by the San José scale. This is very encouraging and leads us to feel that the prospects of stamping it out are not altogether hopeless. People are now realizing better than ever before how dangerous an enemy it is ; but it is remarkable how many mistakes were made in identifying the scale, the oyster-shell bark-louse, the scurfy bark-louse, and others, being mistaken for it. In the localities where the scale is present, its increase and destructiveness have been greater than ever before ; it does not confine itself to one place, but reaches out into new localities beyond its former limits. As an illustration of the very great increase of the scale, I may give one instance. There is an orchard of 1,600 peach trees which was inspected in August, 1899, by seven experienced men ; they spent six days in their examination and only found the scale on 87 trees, showing that the infestation was but slight. In August of the following year, 1900, I could find the scale on every tree I looked at, but still a good crop of fruit was produced. This year (1901) that orchard is practically dead ; it will never bear another crop of fruit ; the scale is to be seen

everywhere throughout it. There are quite a number of just such orchards as that, and they constitute an object lesson which is constantly before the people—they cannot close their eyes to a dead orchard. In another orchard I have eaten peaches this last summer gathered from trees which have since become encrusted with the scale and will soon die from the attack.

There is a third orchard that I know of, a large orchard, from which about 25,000 baskets of peaches were picked this year. About the 25th of September I visited it and found the scale on every tree along a row reaching across the orchard ; unless this orchard is put under proper treatment at once it has only one more year to live The alarming rapidity with which the scale spreads when once it has found lodgment causes it to be so destructive and so difficult to control. Thus far I have spoken of peach trees, but the scale attacks other kinds also. We have instances of plum trees, pear trees and even apple trees which are dead from the attack of the scale. Apple trees I have found more resistant than peach and was inclined at first to think that they would not be much affected, but the evidence to the contrary is too conclusive when we find apple trees which have been killed outright by the scale. The lower limbs are usually attacked first and then it spreads upwards till the whole tree is infested. I visited an apple orchard of 350 trees in 1899 which was then bearing well ; the scale was found but the infestation was slight. Last year it bore a good crop of fruit, but it is doomed and will never bear again—most of the trees will be dead next year.

Now, as to remedies. There are four which serve good purposes. These are whale-oil soap ; crude petroleum, and a combination of these two ; lime, salt and sulphur (the favorite wash in California) ; and fumigation with hydro-cyanic acid gas. Whale-oil soap should be made strong, 2½ lbs. of good soap to a gallon of hot water, and should be applied freely to saturate every part of the tree. Many people sprayed only one side of their trees, waiting for the wind to change to do the other, and ending by leaving it undone. Others sprayed the trunk where there was no scale and left the boughs alone, though they were full of it.

Crude petroleum should be applied with great care ; it seems to be perfectly safe when used for apple trees, which stand it better than any others, but is very dangerous for peach trees. I have never seen an apple tree which has been injured by it in this country ; in New Jersey some trees have been killed, but it was not the crude petroleum that was used. I have found better results from it than from whale-oil soap, and it has also the advantage of being cheaper. The combination of soap and oil is a remedy which requires to be worked out. I am doubtful about it at present but I believe that it will yet prove an excellent remedy when the right proportions have been ascertained by experiment. Fifteen per cent, crude petroleum with water kills the scale but endangers the tree ; 25 per cent. with 1 lb. whale-oil soap and a gallon of water is effective and not injurious to the same extent.

Lime, salt and sulphur as a remedy I like very much, but it is difficult to prepare ; it requires some convenient mode of cooking, which is the important part, and the apparatus necessary for this is not always to be had. When cooked half a day, using lime that had been slacked in boiling water, it worked well, and so whitened every part of the tree that it reached that its application could be clearly seen ; no portion of the tree should be left untouched. The reason this wash is so much more effective in California is because there are no heavy rains there to wash it off. Still, it can be used to good purpose here. Last May was very wet, and it began to rain while we were treating some trees and continued for a long time, yet the wash was successful, and we expect still better results in dry weather.

Fumigation with hydro-cyanic acid gas we tried at different points and at different times during the season, beginning in April and continuing till September. Over 300 trees were treated and a single live scale cannot be found on one of them. In the orchards trees affected by scale were marked and fumigated, the rest were sprayed. It is a troublesome and expensive remedy, but it will pay the fruit-grower to use it, when he would otherwise lose his trees.

If crude petroleum is applied to the trees as late as possible before the buds open in spring it covers the parts treated with a film of paraffine which remains on the trees during most of the summer and effectually keeps off the scale.

Hon. J. Dryden : Which treatment would you put first? Can you depend on any of them to destroy the scale ?

Mr. Fisher : There is no doubt that crude petroleum is the best for destroying the scale, but it cannot be used with safety on some trees. I should not think of using it on peach trees which were in any way weakened ; it should only be applied to the most healthy and vigorous trees. It can, however, be safely used on apple, pear and most plum trees, but not on Japanese or egg plums. Where it can be trusted its effect on the trees is very good indeed. One great difficulty is that the ordinary nozzles are too coarse. I should much prefer a finer one than those made. (Here he exhibited three nozzles—one made by the Spramotor Co., of London, Ont., the other two finer ones that were made by a watchmaker according to his instructions).

Whale-oil soap is a very useful remedy for peach trees which would not stand the petroleum treatment. It should be thoroughly applied until the trees are completely saturated and the scale is entirely soaked. The difficulty regarding it is that it is too expensive. It costs 12 cents for soap to spray each peach tree, while the crude petroleum would only cost 2 cents. A combination of the soap and the oil would cost from 4 to 5 cents. The lime, salt and sulphur wash, taking the lime at 12 cents, the salt at 8 and the sulphur at 30, would cost 1 cent per gallon or 2 cents per tree, using two gallons to a tree. Fumigation costs from 15 to 17 cents for the chemicals required for a full grown peach tree.

The peach tree grower should allow the branches to grow close to the ground without a long trunk, the lowest branches being only a foot above the surface. This produces a tree which is better than a tall one for picking, for spraying, for fumigation and for obtaining shelter ; it also has no long trunk for harbouring borers.

He found that in using crude petroleum with 20 p.c. water more trees were killed by the Ontario oil than by the American, the latter being much heavier. The specific gravity of the Ontario oil was 39½ and that of the American 44½. The former was procured from Wallacetown, Ont., through David Barr of Dutton, and the latter from Titusville, Penn. Undiluted oil sprayed with an ordinary nozzle would kill all trees.

The speaker then gave an account of some of his experiences during the past season. One instance was an orchard at St. Catharines in which he treated a block of trees ; these are all healthy now, while east of them, only twenty yards distant, there are three or four rows of peach trees which were partially treated by the owner and have since all died.

Near Niagara 370 trees, plum and pear, were inspected on September 20th and found so much infested with scale that they could not stand them during the remainder of the season and the fruit was no good. He made a light application with 25 gals. crude petroleum, half a pint to a tree diluted with 25 p.c. of water ; it did not hurt the trees and killed most of the scales. These trees will be treated again in the spring. The addition of water to the oil increases the volume and enables the oil to be more readily sprayed ; it soon evaporates and leaves only the oil on the trees.

I cannot—he said—recommend any remedy that will fit *every* case, nor any nozzle. These may be one-fourteenth inch, one-twentieth, one-twenty-fifth, one-thirty-third, one-fiftieth and one-sixty-sixth. One-fortieth is a good size ; it makes a very fine spray, and the operator can regulate without difficulty the amount applied, as it works more slowly than a coarse one.

Mr. John Law : Does this nozzle ever get clogged ?

Mr. Fisher : No ; the pressure keeps it clear. A long extension pipe should not be used ; the shorter it is the better for satisfactory work.

After replying to several questions regarding spraying apparatus, materials and methods of application, Mr. Fisher said : I find now that there is an entire change of feeling amongst the

people. Two years ago they had not seen trees killed by the scale ; now such cases are frequent and they furnish an object lesson which cannot be misunderstood. Fruit growers who find the scale on their trees, realize that something must be done and done without delay. Experience now shows the wisdom of the methods adopted by the Department of Agriculture, though so much objection was made at first. The only sure and perfectly effective remedy is *burning up* all infested trees. Had we begun our investigations a few years sooner we should have succeeded in getting rid of the scale altogether in this Province, but when once introduced into the country it is no easy matter to trace its whereabouts.

In the fall of 1898 we started out with a long list of suspected nursery stock and on investigation found trees infested with the scale in 100 places. These trees were taken out and burned as fast as they were found, and now the localities where they grew are entirely free from the scale. This, together with the splendid work that has been done in the nurseries, has saved the country from a deluge of scale.

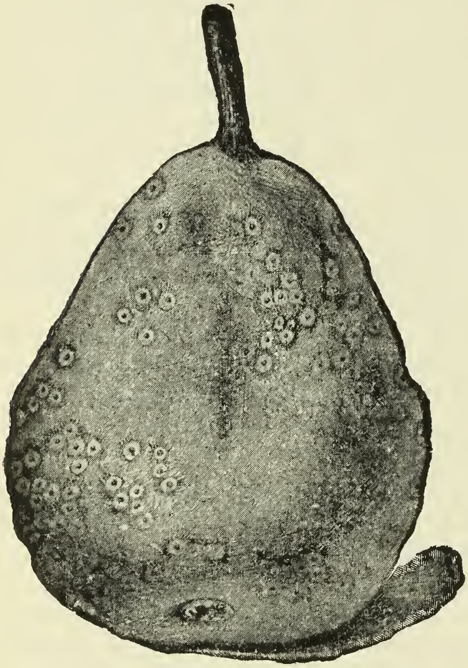


Fig. 1. Pear infested with the San José scale.

Fig. 2. Portion of a branch infested with the San José scale.

In the infested districts the increase and spread of the scale is very great indeed ; but where we have treated the trees, even for one year, the insect is under control. The situation is very much improved and I believe, from the results of our work, that by careful treatment we can control the scale and preserve the fruitfulness of our trees. Where good work has been done for one or two years, the results are such as to justify us in coming to this belief. If the treatment were universal, there would be no spread of the scale.

In answer to questions Mr. Fisher said that many who formerly objected are now treating their trees as they have learnt the necessity for it and seen the good results. The best time for treatment is the month of April. No body of men sent out from the Department of Agriculture could cover the affected territory within that month, it is therefore absolutely necessary that the work should be done by the owners of the trees, who are, of course, the parties most interested in the matter.

THE SAN JOSÉ SCALE IN OHIO AND IN ONTARIO.

Dr. Fletcher, of Ottawa, considered this meeting one of more than usual importance. No subject which had ever engaged the attention of entomologists could compare with that of the injuries done by the San José scale, and the finding of a practical remedy. The Federal, Provincial and State Governments in Canada and the United States had done everything possible to direct the attention of fruit growers and gardeners to the danger of neglecting this terrible pest and allowing it to spread through the country. Much good work had been done, but further experiments were necessary before a quite satisfactory answer could be given to the vital question: "Is there any definite, practical remedy for the San José scale?" He congratulated the Society that the Hon. John Dryden had considered the meeting of importance enough for him to leave his other work in a very busy department to come to London to encourage the Society and to hear the latest views on the subject. The leading entomologists of the world, in America, in Australia and in other countries were now directing their efforts to this very question of getting an effective, easy and cheap remedy for the San José scale.

The speaker had been fortuate enough recently to have an opportunity of going right through the infested areas in Ohio and Ontario and examining the experiments which had been tried to control it. In the first place, it should be stated that the San José scale only exists at the present time, as far as Canada is concerned, in one corner of the Province of Ontario, extending along the shores of Lakes Ontario and Erie in the Niagara Peninsula. The important experiments which had been carried on during the past season by Professor F. M. Webster in Ohio and by Mr. Geo. E. Fisher in Ontario were most instructive, and the results were really very similar in nature. In passing through these infested areas it was noticeable on both sides of the line that it was the same insect with the same habits in both places, the climate and the soil conditions were the same, and the fruit trees and fruit growers were identically of the same nature. The San José scale is without any doubt a terribly destructive insect, but it is so inconspicuous and difficult to detect when in small numbers, that there has been difficulty in getting farmers to appreciate how great the danger is. The great outcry nowadays is for definite information. The speaker claimed that the present occasion demanded, and he intended to make, very definite statements, founded on his recent investigations in Ohio and Ontario, and he knew these would be backed up and confirmed by Prof. Webster and Mr. Fisher, both of whom were present.

In the first place, with regard to the possibility of the San José scale killing trees in Canada. Many had hoped that Canada was too far north for the scale to increase rapidly enough to kill trees outright. In reply to this he had to say that he had recently seen plums and peaches which had been quite killed in two years from the time they were found to be first infested, and many other trees which, although not actually killed, were so seriously injured that they were practically useless. Even apple trees, which were thought to be much better able to withstand the attacks of the scale, were in many places, and particularly with some varieties, so much damaged that they were much disfigured by having a large number of their lower branches killed. It must, therefore, be concluded that the San José scale not only had killed trees outright in Canada in a very few years, but that its powers to increase and do harm are just as bad here as they are in other localities where it has gained a foothold.

The Ohio experiments, carefully planned and worked out by Prof. Webster and his expert assistants, showed plainly the benefit of special training in this kind of work. It was most noticeable that where orchards had been carefully sprayed excellent results had followed. This was particularly the case where the work had been done by the entomologists; however, where good practical fruit growers had carried out the instructions carefully the trees had been protected and paying crops had been secured. The advantage of experience was very

conspicuous in some of these orchards, the owners acknowledging that, although they thought they had done good work the first year, they were now able themselves to see that the second year's work was far better done than the first and they would be in a better position again next year to do the work better and more thoroughly. Some fruit growers had sprayed their trees in a perfunctory manner and had done little good. Spraying, to be effective, must be done with the greatest care as to every detail and with the greatest thoroughness, so that every part of the tree may be treated with the application. There are of course difficulties in spraying as well as in every other operation which is worth doing ; not only must the apparatus be of the very best, but the materials must be of the proper kind and mixed in exact proportions. The applications must be made at special seasons of the year, and it will pay fruitgrowers to see to this important operation themselves.

With regard to a definite remedy, Dr. Fletcher claimed that a definite remedy for the San José scale had already been given to the country. There was nothing particularly new as to methods of work nor which could not be found by everyone in the report of the Inspector of San José scale, which was available for all who would ask for it from Mr. Dryden's department. This was published last spring, and was a most valuable report. It was very regrettable that so few people who owned orchards seemed to be aware of its contents, or there would not be so many enquiries for a definite remedy when the good results given in that report showed that paying crops could be grown in orchards infested with the San José scale if they would regularly apply the remedies which were recommended by Mr. Fisher. In passing recently through infested areas, the fact was borne in upon him that if trees were treated every year, either with the whale-oil soap solution or the crude petroleum application, or, where the size of the trees would allow of it, if they were fumigated every year, paying crops could be grown, and he believed that the trees would year by year become freer from this pernicious enemy. Where trees had been neglected for only a single year, they had become coated with the scale so as to be almost or quite as bad as they were before they were treated.

The three remedies which the speaker claimed were definite practical remedies, were as follows :

(1) Whale-oil soap. This is a potash fish oil soap which can be purchased of good quality of some Canadian firms, of W.H.Owen of Catawba Island, Ohio, and of Good & Co. of Philadelphia, or it can be made with care and with a great deal of trouble by a private individual. To be effective, this mixture must be made of the strength of two and one-half pounds of whale-oil soap to the imperial gallon of water. To dissolve thoroughly, it must be mixed with hot water and is best applied just before the buds burst in the spring. Although, as a general statement, orchards treated with this soap mixture were not so free of the scale as those which had been treated with crude petroleum, still at the same time it was a fact that the two cleanest of those orchards lately examined which at one time had been infested and had been subsequently to a certain measure cleaned up, had been brought to their present good condition by the use of whale-oil soap. There were no very bad trees in these two orchards and scales could only be found with difficulty.

For peach trees this remedy is decidedly the safest to use. Its only drawback is the cost of the material. In large quantities it can be purchased, or made, for about 3½ cents a pound, and of the strength above advised it would require one and a half gallons of mixture containing 3¼ pounds of soap to an average size full-grown peach tree, making about 12 cents for material to each tree. The great advantage is that there is no danger of injuring the trees, and, further than this, the amount of potash in the soap makes it a decidedly beneficial application as a fertilizer.

(2) Crude petroleum. This mineral oil is decidedly more fatal in its effects both upon the scale insects and upon the trees. There are some matters connected with the effect of crude oil upon various fruit trees which still require elucidation, but both Prof. Webster and Mr. Fisher are

working hard on this subject, and, from the progress which has already been made, it is probable that before long their careful experiments (which it is of the utmost importance should be continued) will give results by which the danger of injuring the trees by inexperienced workers will be reduced. Crude petroleum may with care be applied to healthy peach trees as strong as 20 or 25 per cent. of a mechanical mixture with water, but it is very difficult to mix properly, and if applied carelessly or by reckless or inexperienced men there is great risk of the trees being killed. It is not always easy to detect when a tree is enfeebled, and injury may sometimes result to trees which are apparently healthy, but which on examination will be found to have suffered from some other cause. In applying crude petroleum, experience seems to show that one great difficulty is to get a pump which will always throw the exact percentage of oil that is shown by the oil gauge. A perfect pump has never yet been produced and this has always been a difficulty. When in Ohio recently, the speaker was much pleased to hear the London Spramotor Co. pump spoken of in the highest terms, but even this is susceptible of considerable improvement. Another danger may arise from the operator going over his work twice, and of course in that way depositing on the tree twice the percentage of oil necessary. Mr. Fisher's plan is to use not more than one quart of crude oil costing 2 or 3 cents to each tree. The crude petroleum has two great advantages over other remedies if experiments will show us how we can use it without danger to the trees. It is exceedingly cheap, and it leaves a deposit on the trees even after the volatile portion has evaporated. This deposit is vaseline and has the double advantage of showing clearly on the trees what parts have been sprayed and at the same time rendering the bark unsuitable for the young scales to settle upon.

[Some striking examples were here exhibited of bark taken from the two sides of a badly sprayed tree, one showing plainly the residue of the petroleum and no living scales, the other showing no sign of oil and thickly caked over with living scale insects. One piece of bark had on one side of it masses of dead scales as far as the oil had reached and beyond that, where there was no oil, a thick coating of living scale insects.]

Crude petroleum, therefore, is an effective remedy, but great care must be exercised in using it. The great danger will be next year. Carefully watched over and helped by Prof. Webster and his assistants in Ohio and by Mr. Fisher and his assistants in Ontario, remarkably good results have been obtained by some fruit growers; very little harm has been done to peach trees and none at all to apple, pear and plum trees. This state of affairs might probably engender a spirit of recklessness, and the speaker was afraid that next year there would be much loss from fruit growers using the crude oil recklessly or carelessly. There was no doubt at all that many who had even purchased crude oil this year had abstained from using it, for fear of injuring their trees, but had watched the outcome of their neighbours' experiments. As no cases of injury had occurred, a great many trees would be treated next year. It was therefore most important to advise caution.

(3) Fumigation. The most effective remedy is fumigation with hydrocyanic acid gas, which will destroy every living insect, but which if applied as recommended will do no harm at all to the trees. For small trees this has proved very useful, but for large trees the necessary tents and apparatus are expensive and there are difficulties which have yet to be overcome in the way of getting the gas equally diffused beneath the tents.

Summing up what he had brought before the meeting, Dr. Fletcher claimed that, notwithstanding the great danger which still exists from the presence of the San José scale in Canadian orchards, the experiments of entomologists had provided remedies which were as practicable and as effective as those which were used for many other injurious insects, and that by their regular use trees could be kept in health and in a bearing condition. He would not believe that the extermination of the San José scale from Canadian orchards was an impossibility. What could be done on one tree could be done on many. Combination, and

co-operation were what was most needed in this matter, and, in the same way that farmers did not nowadays thresh their own grain but had this done for them by men who made a special business of doing it, he looked forward to the time when expert sprayers who knew their business, would travel from place to place spraying orchards for the various insect enemies. By this means, better work would be done and at a smaller cost than if each fruit grower did his own work. Fruit growers must remember that the application of these remedies was no easy matter which could be attended to by an untrained man. The Ohio and Ontario work were one huge experiment which was being keenly watched by scientific men and political economists. It was not a matter of the prosperity of a few individuals and the protection of their orchards, but of the discovery of a practical means of saving one of the most important industries of the country. This was not to be calculated by a few thousand dollars but by millions, as any one could see who would consider the amount of capital invested in orchards in Canada and the United States and then visit the dying neglected orchards.

It was a matter of congratulation that Prof. Webster was present ; he is one of the most highly esteemed of the scientific workers in entomology in the world and has taken up this matter ; nor was the Province of Ontario less fortunate. Mr. Fisher's enthusiasm and his peculiar adaptability for the delicate and difficult work which he had undertaken were apparent to all. The speaker trusted that these gentlemen would continue their important experiments in the directions which they had explained to him, and he felt convinced that substantial advance would be the result of another year's investigations. The Society had invited Prof. Webster to be present at this meeting, knowing that his advice and suggestions would be of extreme value. Mr. Fisher has been for some years a member of our Society, and we all know how reliable he is.

Professor Webster, of Ohio, was next called upon to address the meeting. He said that the problem they had to solve in Ohio was exactly the same as in Ontario, and it was the most tremendous the world had ever had to face as regards insects. He was constantly asked for a *cheap, easy and perfect* remedy, but such was not to be had ; however nearly it approached perfection it could not be easy nor could it be very cheap. Machinery was required which could not be produced in a day, but would be the result of long-continued experiments and constant improvements. He had not yet been able to find a good sprayer ; the best so far made [it was gratifying to hear] was made in London, Ontario, by the Spramotor Co., but it was capable of improvement. In time, no doubt, we shall get what we want. It was the same with insecticides ; we have not yet found out the very best materials and their combinations.

We know that countries differ, and that fruits which flourish in one region cannot be successfully grown in another. And so it is with insects ; they vary very much in numbers and in injuriousness in different localities ; some, for instance are destructive in Southern Ohio which do no harm in the northern part of the State. What people expect us entomologists to do is to provide them something that can be put in an orchard at no cost, and with no attention will kill all the noxious insects and not affect the beneficial ones.

(He then described the construction of fumigating houses, and stated that they had made them with slatted floors so that the deadly materials could be shoved under without danger.)

In addition to good apparatus, trained men were also wanted in order to do the work properly, just as skilled men were required for driving an engine. Such men should be provided with good machinery and then go about the country. They could do the work far better and much cheaper than untrained men ; there was an opening here for a paying occupation. And it was one in which almost continual employment could be obtained ; for instance, in July there would be the spraying of vineyards with Bordeaux mixture, later on the fall treatment for scale, all winter the same treatments, in the spring spraying for codling-moth, plum curculio, etc., then Bordeaux mixture, and so on—something to do nearly all the year round.

In Ohio, trees hopelessly attacked with the scale are marked for destruction and the owner is compelled to destroy them. Others less badly infested must either be destroyed or sprayed with whale-oil soap or crude petroleum and water, and the owners are held responsible for any damage arising from neglect.

At the present time, if remedies are properly used, we can reduce the scale 90 per cent. in one year; the other 10 per cent. cannot be exterminated. One tree might be absolutely cleared of the scale, but a whole orchard cannot. The condition of vitality of the trees makes a great difference. Thrifty young peach trees will stand 25 per cent. to 30 per cent. crude petroleum, while older and feebler trees were killed with 25 per cent. He now uses 20 per cent. of oil with one pound of whale oil soap. On the whole he considered that we are getting on as well as we can possibly expect.

Dr. Fletcher: Why cannot we kill the last 10 per cent.? If we spray with crude petroleum this year there will be a covering of vaseline left on the trees; this will be increased the second year and the third, and at length the tree will become unsuitable for the scale and free from danger of attack.

Prof. Webster: There is no difficulty in treating apple-trees in this way and securing immunity; but I was speaking of peach-trees which cannot stand the same amount of petroleum. I agree with Mr. Fisher that the heavier oil is the most satisfactory.

Mr. Fisher stated that he had treated infested trees for three years in succession; they recovered health and vigour, and bore fruit, and were not injured by the continuous treatment.

Prof. Lochhead expressed his sense of the importance of the subject under discussion and his appreciation of the value of the information that had been imparted by the speakers.

Hon. J Dryden said that he had listened with great interest to the excellent addresses of the speakers, and was rejoiced to learn that definite measures for the extermination of the scale could now be adopted. It was undoubtedly a most serious danger to the fruit industry of this Province, and every possible means must be employed for its removal. The difficulty at the outset was to persuade the public that this danger existed; many people do not believe it even now. Nothing can be done to enforce remedies unless people believe in the deadly character of the scale. The application of the remedies must rest with the people themselves, but they must be taught what the remedies are and how they are to use them. This is what the Government should do and is trying to do.

But how are we to impress this upon the people? The answer is by education—by teaching them first the danger and then the means with which to combat it. The Entomological Society and the Fruit Growers' Association could do good work in this respect. Every fruit grower in the Province must be impressed with the danger to his own fruit and also to that of his neighbour, if this scale is not repressed. At the beginning of the operations for its extermination, drastic methods were adopted because it was supposed that the scale was confined to a few spots only, and we wished to exterminate it. This system was continued till considerable opposition was aroused and some excitement was created. An endeavor was made to find out the range of the insect and what the cost of its extermination would be; if the information received was correct, $300,000 would have been required for compensation. If half a million dollars would wipe it out now the Government would gladly pay it. At present we are trying to hold it in check and to prevent its spread.

Educate, educate, must be their watchword. From now on we must strive to teach people about this scale—how to deal with it and what the danger from it is. It would be a great thing to teach people how to spray by sending competent men about whom they could *see* doing it; no matter how plain written directions might be, they were of little use unless people were shown how to do it. This was the experience in improving the butter-making of the country.

The great danger lay in our nurseries, from which scale-infested stock might be sent out and the insect planted all over the country. We had an instance of this in the 100 trees two

years ago to which Mr. Fisher has referred. How is this danger to be overcome? Inspection alone is not enough, as some scales in a nursery may be overlooked even by the keenest inspector. The only plan then is to require compulsory fumigation of all nursery stock before it is sent out, and this must be done by a man sent by the Government, who shall see that the fumigating house is perfect and the work perfect. This is all that we now have to prevent with certainty the dissemination of the scale, but we shall have to go further and allow no stock to be sent out of a nursery that is in an infested district.

It is desirable that further experiments should be made with the gas treatment. The ordinary man will not believe that infested trees in the middle of a waggon load and tightly tied together can be reached by the gas. This should be tested. The fumigating house must be constantly inspected to see that there is no leakage, and this work must be done by an officer of the Government.

On the whole Mr. Dryden felt that we were in a better position now than this time last year, and he felt very hopeful for the future. He had great confidence in the efforts that were being made for the preservation of our fruit trees, and believed that if the danger were once fully and generally realized, our fruit-growers would spare no efforts to exterminate the scourge.

Prof. Webster stated that he had tried infested trees soaked in water and others daubed with mud, and in no case had a scale got through the fumigating house alive.

Hon. J. Dryden: There are thousands of trees in a nursery. If there should be only two or three scales on a small tree, how can inspectors tell their presence? It is therefore absolutely necessary to resort to fumigation.

Dr. Fletcher quite agreed with this, but considered the inspection of nurseries most important for the discovery of infested places and he believed it to be a very wise provision.

Mr. Fisher said that an experienced inspector could discover the scales in a marvellous way, and would often detect them where the owner of the trees failed to see any. With regard to the 100 trees destroyed, already referred to, he considered that the destruction of each one was worth a thousand dollars to the country.

EVENING MEETING.

A meeting, to which the members of the London Horticultural Society and the public generally were invited, was held in a lecture room at the Normal School. Notwithstanding the inclemency of the weather, the first snowstorm of the season prevailing at the time, the hall was completely filled by a very appreciative audience. At 8 o'clock the meeting was called to order by the President, Rev. Dr. Fyles, South Quebec, who spoke of the honor done to the Society by the presence of the Hon. John Dryden, Minister of Agriculture for Ontario, and by his kindly consenting to preside that evening.

The Hon. J. Dryden then took the chair and delivered the opening address. He said that he esteemed it a great honor to preside over a meeting of the Entomological Society, which was one of the best as well as the oldest of the associations aided by the Government of Ontario. It had always been composed of gentlemen of wealth, of education, and above all of public spirit, who were willing to devote their time and ability to the objects of the Society. While it was one of the oldest, it was also one of the most useful associations connected with his Department in the opinion of a practical man like himself. We need its accurate work and we have been greatly aided and helped by it during all the nearly forty years of its existence; no doubt we shall continue to be helped by it during the years to come. He was present at this annual meeting to show his interest in the Society, and the interest which was taken in it by the Government and the Legislature of Ontario. He should like to inspire everyone with enthusiasm in the work of the Society which was doing so much for the country by its studies

of insect life both in its destructive and beneficial aspects. He congratulated the members on their extensive collections of insects and their library, which was the best of its kind in this country, and would be found most useful by young men of scientific tastes.

The Rev. Dr. Fyles, of South Quebec, read his presidential address and illustrated it with a number of beautifully executed colored diagrams, the work of his own hand. His charming manner and choice diction added to the interest of the subject, and held the unflagging attention which was bestowed by the audience.

THE IMPORTANCE OF ENTOMOLOGICAL STUDIES TO THE COMMUNITY AT LARGE.

By the Rev. Thomas W. Fyles, D.C.L., F.L.S.

The poet Crabbe gives us a glimpse of an entomologist of his day. He says,—

"There is my friend the Weaver: strong desires
Reign in his breast; 'tis beauty he admires:
See! to the shady grove he takes his way,
And feels in hope the raptures of the day—
Eager he looks: and soon, to glad his eyes,
From the sweet bower, by nature form'd arise
Bright troops of virgin moths and fresh-born butterflies;

* * * * * * *

"Above the sovereign oak, a sovereign skims,
The purple Emp'ror, strong in wing and limbs:
There fair Camilla takes her flight serene,
Adonis blue, and Paphia silver-queen;
With every filmy fly from mead or bower,
And hungry Sphinx who threads the honey'd flower."

Crabbe wrote in no unkindly spirit, for he was himself a naturalist; but, by the general public of his time the entomologist was regarded as one who rode a useless hobby, as one who wasted his time in trivialities.

Yet, doubtless, it was better that the weaver should spend his leisure hours in the woods and fields, improving his health by exercise and fresh air, and having a definite purpose in view, than that he should idle them away in the frouzy haunts of men of his class. We may well believe that he would return to his usual avocations with greater courage, because of the pleasure and refreshment that his outing, amid—what Hood calls,—

"The boundless prodigality of nature,
The balm, the bliss, the beauty and the bloom,"

had given him.

For some years before Crabbe's death, the friendly Stephens, to benefit just such entomologists as Crabbe had portrayed, opened his doors on every Wednesday evening, and received both acquaintances and strangers alike—placing his books and his fine collections at their service, identifying specimens for them, and giving them scientific information.

Stephens died in 1852: but the Wednesday evening "at homes" were continued by Stainton, editor of "The Entomologist's Weekly Intelligencer," at his residence at Lewisham.

The services rendered to the cause of English entomology by Stephens, Stainton, Newman,* Douglas,† and others of their time, ought never to be forgotten. They raised entomology in public estimation; they changed many a mere collector into a useful man of science; and they prepared the public mind to welcome the publications of the entomological authors who came after them.

I think Stainton's "Manual of Butterflies and Moths" (in two volumes) was the most complete work of the kind—the best adapted to its purpose—that had then appeared. It was

*Editor of the "Zoologist" and author of the "Insect Hunters," etc.
†Author of "The World of Insects," etc.

cheap, readable and concise, sufficiently illustrated, and systematically arranged. It contained descriptions of larvæ, pupæ, and perfect insects, with the dates of their appearance and the localities, known to the author, in which they could be found. It also gave the names of the food-plants of the larvæ.

In 1859 Dr. Breckenbridge Clemens wrote to Stainton from Easton, Pennsylvania, and said : "With us (in America) everything has yet to be done." He also told of efforts that the authorities of the Smithsonian Institution were about to put forth ; and he predicted a bright future for American entomology. His prediction has been amply fulfilled.

In all probability Stainton's work was well known to the founders of our own society which is now in the 38th year of its existence, and which has done so much good. Some of the original members of the society are still among us. Long may they live ; and may their influence be felt in ever-widening circles !

I do not doubt that there are many to-day, especially among the young, who are, as yet, mere collectors. They stand, so to speak, within the vestibule of the Palace of Science, and they should receive a hearty welcome, and be encouraged to go forward, for there are noble apartments, well-furnished, open before them, and the farther they go the better they will be entertained.

The collector will soon wish to learn the names of his captures, and then the proper position of each with regard to the others, and so SYSTEMATIC ENTOMOLOGY will engage his attention. I would, therefore, urge parents and teachers to encourage a taste for Natural History in the young people under their care ; and I would adopt the words of Warwick James Price and say, Here's to the school-boy—

"Who one day in seven
Slips off to the country to find it a heaven,
And reads in the sunshine, the fields and the brooks,
A wisdom the truest, not printed in books."*

The tyro in entomology in this city has a very great advantage in being able to examine the Society's collections, in which a vast number of our Canadian insects are correctly arranged in their orders, tribes, families and genera, and are beautifully kept by our curator, Mr. Alston Moffat.

But I need not say that the Entomological Society of Ontario has far higher objects in view than those that appertain to RECREATIVE ENTOMOLOGY and SYSTEMATIC ENTOMOLOGY. Let any one examine its thirty-one annual reports, and he will find that what is known as PRACTICAL OF ECONOMIC ENTOMOLOGY has received from it a vast amount of attention. It has investigated the habits and traced the life-histories of creatures that affect our growing crops, our stores and home-supplies, our live-stock, and our domestic and personal comfort ; and it has spread most valuable information as to the best methods of dealing both with our insect friends and insect foes. There is much that comes under the head of Practical or Economic Entomology to interest us all.

The subject of the Agency of Insects in the Fertilization of Blossoms has been brought before us by such writers as Percy Groom and Grant Allen ; and many interesting enquiries in this direction present themselves. For example : How is it that the Quebec farmers have to send elsewhere for their Red Clover Seed ? They can grow fine crops of Red Clover hay—why do they not raise the seed ? The answer may be given as follows :—

The insect that affects the fertilization of the Red Clover is the Humble Bee. On the approach of Winter all the Humble Bees perish, except one or two impregnated females from every nest. These creep into snug refuges and hibernate. The winters in Quebec are severe, and linger long ; and the few Humble Bees that survive them do not commence operations till

* "The Munsey," July number, 1896.

the very end of May. They have then to form their nests, collect bee-bread, and lay their eggs; and some time elapses before the working-bees begin to appear. Vegetation on the other hand proceeds with astonishing rapidity—with leaps and bounds ; and the clover fields are in bloom before there are Humble Bees in sufficient numbers to accomplish the important work designed for them ; and so the clover blossoms are, in the main, unfertilized, and afford but little seed. The season is too short to allow the ripening of seed in the rowen or after-math.

The Humble Bees are among our best insect friends ; and yet how many a farmer on discovering a humble-bees' nest becomes possessed with an insane desire to destroy it.

The rough coats of bees are admirably suited to sweep the pollen from the anthers of flowers, and to convey it from blossom to blossom.

The pollen of plants is in itself well worthy of examination. It presents a remarkable variety both in form and color, as a few descriptions will show :—

The pollen-grains of the Orange Lily are ellipsoid, and of a deep Indian red.

Those of the Sun-flower are globular, and of a golden yellow.

Of Geranium the grains are round, warty and of the color of raw sienna.

Of Malva, the grains are round, set with spines, and of a pearly white.

The Sweet-pea has pollen-grains oblong in outline, and of the colour of amber.

The Petunia has grains egg-shaped and of pale lilac.

The pollen-grains of Mignonette are of a long oval, and are flesh-coloured.

A wide and interesting field for investigation is presented to the Entomologist and Botanist in the subject of the fertilization of blossoms by insect agency.

Scientists have of late made considerable advances into a field which, though not altogether unrecognized, had been but little explored—that of MEDICAL, OR HYGIENIC ENTOMOLOGY. Physicians have long studied that part of it which comes under the head of Dermatology, and have also written much upon internal parasites ; but the subject of the spread of disease by the agency of insects has not until lately, entered largely into their studies.

Forty years ago a French-Canadian gentleman told me of a person who had died of "Charbon," resulting from the bite of an insect. He explained to me that the insect had, in all probability, made an attack upon a diseased animal before assailing the man.

In conversation with others, and in the course of years, I have heard of other cases of this *Charbon* or *Anthrax*, produced by insect agency.

That this terrible disease may be readily conveyed to human beings may be learned from the case of Mrs. Mary O'Neill, of Titusville, Pa. She, having washed the soiled linen of her husband who had handled infected hides in a tannery, was taken with anthrax, and died in a few days in great agony.*

The panic that ensued on the spread of the information that several persons had died from the assault of an insect popularly called the "Kissing Bug," viz.: - *Melanolestes picipes*, Herrich-Schæffer, had at least this good effect—it drew the attention of Entomologists more closely to the subject of the spread of disease through insect agency.

Important investigations have been made as to the spread of malaria through the bites of mosquitoes ; and the timely publications of Dr. Howard, of Washington, D.C., have thrown much light upon this subject, and given valuable information upon the various kinds of mosquitoes found in North America and their habits. His work (published by McClure, Phillips & Co., New York) should find a place in every Naturalist's library.

The ever-present House-fly, *Musca domestica*, has, under like investigations, risen in public recognition from a merely troublesome household pest, into the "bad eminence" of a possibly dangerous foe. It is found that it is capable of conveying the baccilli of disease from the sick chamber to the kitchen and the dining-room. For valuable information on this point I would refer

*Quebec Morning Chronicle, Sept. 16th, 1901.

you to a paper by Dr. Howard in Bulletin No. 30, New Series. U. S. Dep. of Agr.; one by Dr. Smith Ely Jelliffe in "The Munsey" for August of this year, and one by Dr. Fletcher, No. 3, vol. XXXIII of "The Canadian Entomologist."

We are beset by these insidious foes; and those who tell us of the dangers from them are public benefactors. "To be fore-warned is to be fore-armed."

Flies come from without; and pains should be taken to keep them without—as may be done by the use of gauze blinds and doors. Those that enter should do so to their destruction. Now that the fly-papers known as "Tangle-foot" are so cheap, and so effective, it ought not to be very difficult to keep the house free from flies.

Another subject that should raise the science of Entomology in the estimation of the public is that which may be called COMMERCIAL ENTOMOLOGY. And by this I do not mean the traffic in insects between dealers and collectors; though there are firms both in America and Europe doing a considerable business in this line. I have the price-list of an English firm before me; and it is curious to note the amounts asked, per pair, for some of our Canadian insects:—

For *Papilio Turnus*, 3s. 6d.
Colias Eurytheme, 1s.
Argynnis Atlantis, 5s.
Melitœa Phaeton, 1s.
Hemaris Thysbe, 3s.
Deilephila lineata, 2s.
Sphinx luscitiosa, 8s.
S. drupiferarum, 6s.
Ctenucha Virginica, 3s.
Prionoxystus robiniœ, 10s.

The covers of our Entomological magazines by their advertisements and notices, show that this kind of traffic is widely carried on.

No, I do not refer to this traffic when I speak of *Commercial Entomology*: I refer—

1st, To the unintentional transportation of insects from foreign lands by shipping, and their trans-continental conveyance by train, etc.

2nd, To the importation of insects, and insect productions, as merchandise.

(1) One night, in August last, my business took me along one of the wharves of the Louise Basin at Quebec. On one side of my path was a long store-house; on the other was an ocean steam-ship discharging her cargo. The whole scene was brilliantly lighted with arc lights attached to the building. I paused under one of the lights to notice the water-flies that had been attracted by it. Besides these, there were a few moths and a number of cockroaches (*Blatta orientalis*, Fischer). The last had, I doubt not, come from the ship. And I was reminded by them that their species was brought to England by ships trading to the Levant; and from England they have been sent to many lands. They have of late years become exceedingly numerous in Quebec.

Fig. 3. Cabbage Butterfly (*Pieris rapœ*).

House-flies have been carried in ships even as far as New Zealand; and where flies are found, there we may expect to see spiders. So we do not wonder that Henry Christopher McCook writes:—"Some of our American spider species have been imported from Europe, and I have seen them on vessels stowed away in divers crannies, and under sundry parts of the ship."*

Of imported insects that have made a stir in Canada, the Cabbage Butterfly (Fig. 3), the Larch Saw-fly (Fig. 4), the Mediterranean Flour Moth (Fig. 5) and the San José scale are examples too well known.

* *Old Farm Fairies.* Appendix, Note C, p. 18.

It is probable that *Zeuzera pyrina*, Fab., (The Leopard Moth), *Porthesia auriflua*, W. V., (The Brown-tail Moth), and *Ocneria dispar*, Linn, (The Gypsy Moth), will some day find their way to Canada, as they have effected a lodgment in the States.

I am sorry to record the advent of the Buffalo Carpet Beetle (*Anthrenus scrophulariæ*, Linn), to the Province of Quebec. I found it last July at Lennoxville and also at Sherbrooke. It had, I suppose, been conveyed to Canada in woollen goods from the United States.

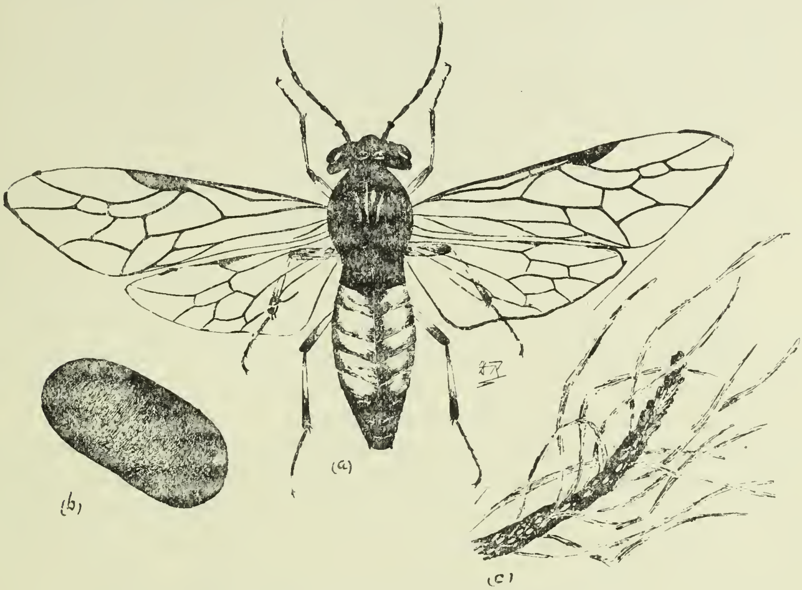


Fig 4. The Larch Saw-fly, cocoon and eggs.

It is worth a degree of attention that we cannot now give, as to whether the set of insect migration was originally from West to East, or from East to West ; and how far the great land features of this continent have checked the spread of immigrant species ; and to what extent climatic and other influences have affected their form and coloration.

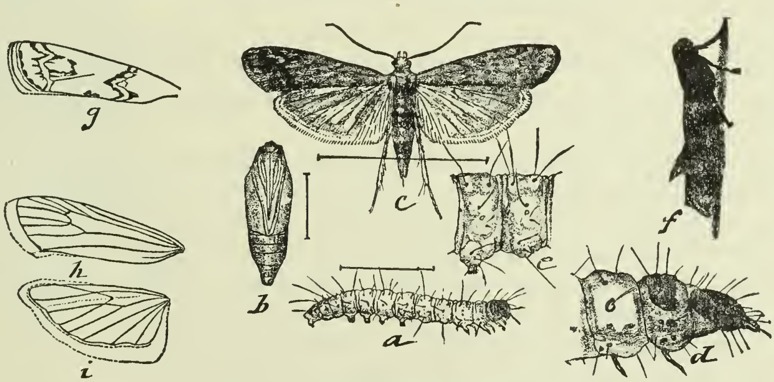


Fig. 5. Mediterranean Flour-Moth.

Some species of our British Columbian insect fauna seem to me to have a much nearer general resemblance to European species, than to those of Eastern Canada and the New England States. For examples :

Parnassius Clodius, Men., has a likeness to *Parnassius Apollo*, Linn.

Anthocharis Ausonides, Bdv., to *Pontia Daplidice*, Fab.

Melitæa rubicunda, H. Ed., to *Melitæa Artemis*, Fab.

Cœnonympha inornata, Edw., to *Cœnonympha Pamphilus*, Westwood.

Such questions as these might come under the head of GEOGRAPHICAL ENTOMOLOGY.

But it is (2) to the importation of insects and insect productions as merchandise that I would more particularly draw your attention. And first to the importation of silk and silken goods.

The silk manufacture has been carried on in China from time immemorial. Its beginning—like that of the cultivation of grain—has been lost trace of in the lapse of ages. In the third century of the Christian era, silk brought to Europe was of so much value that the Emperor Aurelian (most ungallant of men !) refused his wife a silk dress, on account of the cost.*

In the 6th Century two Eastern monks visited India and acquired a knowledge of silk culture. They secreted eggs of the silk-worm moth in the heads of their walking-sticks, and carried them to Constantinople. In the neighborhood of that city silk-culture was first practised. From thence it spread to Italy, and subsequently to France. On the revocation of the edict of Nantes in 1685, 70,000 Huguenots sought refuge in England and Ireland ; and some of them established the manufacture of silk at Spitalfields and Derby.†

In the days of Queen Elizabeth silk-stockings were a costly luxury ; and it is said that James VI of Scotland, on one occasion, borrowed a pair from the Earl of Mar, that he might present a respectable appearance before the English Ambassador.‡ In the fiscal year ending June 30th, 1899, the people of Canada indulged in silk hosiery to the value of $4,119.

The total value of silk goods imported to Canada in the year mentioned was $3,753,539, on which custom dues amounting to $1,091,218.29 were paid.

Next in importance to the traffic in silk and silken goods comes that in honey and wax.

In Canada itself Bee-culture has been raised to great perfection ; and vast quantities of wax and honey are obtained. But the home supplies are not equal to the demand. And so we find that, in the year mentioned above, 33,564 lbs. of bees-wax were imported from the United States. The value of this was $8,941 ; and upon it $894.10 was paid as duty. Of honey and "imitations thereof" 83,888 lbs. were imported—the value of which was $8,579, and the customs duty $2,-482.97.

The importations of honey were of course small to those Provinces in which the home supplies were large, and, *vice versa*, large to those whose home-supplies were small, or altogether wanting. Thus by Ontario 98 lbs. only were imported, while to British Columbia 32,487 lbs. were sent ; and to the Yukon, 49,694 lbs.

Large quantities of wax are used in the manufacture of candles for use in the elaborate ritual of the Roman Catholic Church. I lived for some time near a manufactory of these candles. The yellow wax came in sheets, which were blanched by being spread upon the grass and exposed to the air and the sunshine.

Next in importance to the trade in wax and honey is that in cochineal.

The cochineal insect, *Coccus cacti*, is raised in great numbers in Mexico. It is a suctorial insect, and its food-plant is the Nopal or Indian Fig, *Cactus cochinellifera*. Extensive plantations of cacti, or nopaleries as they are called, are formed on the mountain slopes ; and there the Indians locate, watch over, and at length secure their charge. In appearance the dried insects resemble shrivelled berries, or grain. They are of a mulberry colour, and have a whitish bloom. It takes 70,000 of them to the pound weight. Of the cochineal brought into Canada in the time mentioned, 2,512 lbs. came through Great Britain and 30,675 lbs. through the United States. The value of the whole was $1,708. According to the computation just made 232,309,000 dried Cochineal insects were brought to Canada in the year. The substance called Lac is a production of another Coccus, viz.—*Coccus lacca* which feeds on *Acacia arabica* and other trees. It is a

* Kirby and Spence's Entomology, Letter X.
† History of Insects, R.T.S., p. 153.
‡ Kirby and Spence's Entomology, Letter X.

native of India. Insects of the species crowd together, puncture the bark of their food-plant, and gradually become encrusted with a resinous matter which exudes from their bodies. This substance comes to us in its crude state, and also under different forms as shell-lac, button lac, sheet lac, etc. It is used in the composition of varnish, sealing-wax, etc., and in the colour called lac lake. 146 lbs. of lac valued at $29 was brought into the Province of Quebec during the year mentioned, for home consumption.

One other production of insects must be mentioned here namely nut-galls, or Aleppo galls. They are caused by the punctures made by a Cynips, *Diplolepis gallæ-tinctoriæ* ; and they abound throughout Asia Minor. They are gathered by the inhabitants, and exported from Aleppo (hence the name), and other ports of the Levant. They are used for dyeing purposes and in the manufacture of ink. 534 lbs. of these galls were imported to Ontario in the year mentioned, and 13.296 lbs. to Quebec. The whole being valued at $1,065.

The total value of insects and insect productions admitted to Canada in the year ending June 30th, 1899, was $3,773,832, upon which duties amounting to $1,094,595,36 were collected. These figures show the importance to the community at large of what I have called Commercial Entomology.

But there are yet higher lessons to be learned in our consideration of insects than those which have reference to them as they affect our food supplies, health and business interests.

"All Scripture" we have learned "is profitable for doctrine ;" and in the "Book of Nature," there are many "parables" which illustrate and enforce Divine truths. The student of well-balanced mind cannot advance far in the study of insects without perceiving that they bear ample testimony to the fact that there is a Divine Intelligence, an all-wise, all powerful and beneficent being who has fitted them to their surroundings ; who has numbered their parts, and proportioned them with the utmost exactness ; who has made them beautiful in their season ; who has foreseen their requirements, and ordered all their ways, and whose goodness is over all His works. Who has, in short, made record of Himself in these, the works of His hands.

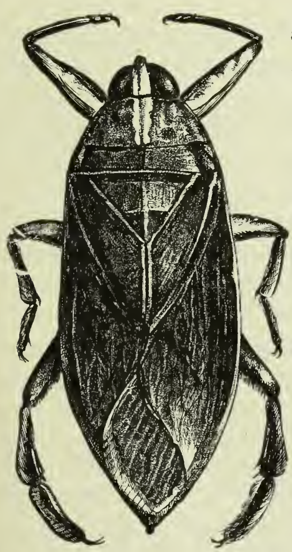


Fig. 6. The Giant Water Bug.

(1) God has adapted the insect to its environment.

Take for example the Giant Water Bug, *Belostoma grandis*, (Fig. 6). This creature spends a great part of its existence in the water, but comes forth, in its perfect state, to seek a mate, and to move to other waters. It lives by suction, preying upon fish and other denizens of the pools and streams. It is necessary that it should be able to float on the surface of the water and to dive beneath it ; that it should have a quick sight, great powers of motion, a strong grasp, suitable breathing apparatus and mouth-organs, and powerful wings to sustain its large body in its aerial excursions. With all these it is admirably provided.

Its body is the shape of a well-proportioned wherry. Its hind legs are sweeps for propelling it through the water. The fore-legs are grapnels, ending with sharp claws, to enable it to hold itself against a current or to cling to its prey ; whilst the middle pair of legs serve to steady it, and also as rudders, to guide its course—the rudders of ships, you will remember were, in early days, placed upon the sides. The eyes of the bug are large and protuberant. The cornea is made up of a vast number of facets, which are hexagonal, and beautifully regular, both in size and shape. The proboscis of the insect is protected by a sheath or cover. The instrument itself is brown, and polished, and comes to a sharp point. Around the edge of the insect's abdomen, under its close-fitting wings, there is a smooth channel, though all the rest of the upper

side of the abdomen is covered with a thick brown pile, like that of plush. This channel is probably a receptacle for a supply of air, for use when the insect takes a plunge into the depths.

Who fitted the water-bug to the part it has to play? It did not fit itself. Man could not do so, any more than he, by taking thought, could add one cubit to his stature, or make one hair white or black. Did Nature? No—we do not deify Nature. There is a Divine Being who originated and controls natural forces—who designed this creature, so admirable in every part.

(1) The exactitude with which every species of insect is formed excites our admiration.

Consider the wasp (Fig 7). The male has 13 joints in the antenna: the female has 12—neither more nor less in either case. The male has invariably 7 segments in the abdomen, and the female 6. Then, moreover, the limbs of the wasp consist of five parts—coxa, trocanter, femur, tibia and tarsus; and in the tarsus there are five joints. Who counted out these things and fixed the rule? Who traced out the lines and spaces in the wings, so exactly that the species of the insect may be told from the wings alone? The same God of whom David wrote :—

Fig. 7. A Wasp (*Vespa maculata*)

"Thine eyes did see my substance yet being unperfect; and in Thy book all my members were written which in continuance were fashioned when as yet there were none of them." Ps. CXXXIX, 16.

The God who counts and measures.

Who taught *Vespa Maculata* Linn. to build its wonderful nest of wood-pulp; and gave it the geometrical and mechanical skill to form its hexagonal cells (Fig. 8), and suspend them, tier below tier, in such a marvellous way?

Fig. 8. Wasp (*Polistes*) and its Comb.

The same God, "Who hath measured the waters in the hollow of His hand, and meted out heaven with the span, and comprehended the dust of the earth in a measure, and weighed the mountains in scales, and the hills in a balance." Is. XL. 12.

(3) What exquisite beauty does the insect world display to the admiring gaze of men. Who was it gave to *Philosamia Cynthia* its lovely dress of fawn colour embellished with delicate mauve, and ornamented with the pale lunettes to which it owes its name?

And who gave to *Phlegethontius cingulata* its wonderful gradations of colouring—its rings and vandykes, its bars of black and carmine, and its white-spotted borders? It was that Beneficent Being who delights in beauty and grace, who in love to His creatures has made all nature—

"Beauty to the eye,
And music to the ear."

(4) In 1873, before the moth *Cossus Centerensis* had been named and described by Dr. Lintner, I found protruding from the trunks of Balsam Poplars growing on the banks of the Yamaska River a number of empty chrysalis cases of this species. I examined the bolls of the trees carefully and was rewarded by finding a fine female of the moth. I was not then sufficiently acquainted with the Cossidæ to know that this belonged to a new species I then peeled away some of the bark from one of the trees and found the mouth of a tunnel—over this I fastened a piece of netting—so as to form a bag; and, by this means, I secured a male of the species. I have the pair in my collection still.

Cossus Centerensis lays an egg in a crevice of the bark of a tree. The little caterpillar that comes from it bites its way into the wood. Its tunnel is at first a mere pin-hole, and is soon

closed by the *frass* it leaves behind it. As the larva grows it enlarges its tunnel till at length its instinct warns it to work upward and outward. This it does till it leaves only a film of bark between it and the outer air. It then retires some inches down its tunnel so as to be out of the reach of the sharp bill and long tongue of the wood-pecker. There it assumes its pupal form. When the time for the imago to appear approaches how can the footless chrysalis ascend its shaft and push its way through the screen of bark? Ah, that difficulty has been foreknown and provided against by Him, "who sees the end from the beginning." Around every abdominal segment of the chrysalis there are teeth or serrations in due order, which enable the chrysalis to secure a hold on the sides of its tunnel, to work its way up and to give it a purchase so that it can break through the closure of bark. It extrudes its body till the wing-cases are free, and then its skin is rent and the moth escapes.

Man learns by observation, experience and communication with his fellows, and provides against possible contingencies, but this creature, up to the time it leaves the chrysalis, has had no intercourse with its kind—has led a solitary existence, pursuing the course marked out for it. It has been ignorant of its future. It could not of itself provide either against danger or change. But its course, its wants, the means for its security and comfort, its entrance upon a higher existence, all these on the dawn of creation—

"Hid in God's foreknowledge lay."

The Grand Architect of the universe made careful and exact provision for the creatures of His hand.

The science of entomology abounds in lessons. To the consideration of the lovers of beautiful objects, of the young, of pleasure-seekers; of gardeners, fruit-growers and farmers; of merchants, store-keepers and house-keepers; of physicians, pastors and teachers; of thoughtful and pious men and women everywhere, I commend it. *It is of importance to the community at large.*

The Chairman, Hon. J. Dryden, expressed the pleasure with which he, and he was sure all present, had listened to Dr. Fyles's interesting and instructive address. He then spoke of the powers of observation with which everyone is endowed, and impressed upon all the importance of cultivating this faculty to the utmost and obtaining the valuable results which would follow from doing so.

Dr. James Fletcher, of Ottawa, Dominion Entomologist and Botanist, was next called upon to address the meeting. He spoke of "The Value of Nature Study in Education," and held the close attention of the audience during his half hour's address, of which the following is a brief outline:—"Nature Study," he said, was a very simple matter, but one which was often misunderstood. It was not a study of natural history but a training to enable us to observe and understand, as far as possible, everything that comes before us. It teaches a child to notice the common objects about it and to see far more than it otherwise would. The addition of the study of natural objects to the school and college curriculum would exercise a very useful and important influence. True education is the drawing out of the faculties to enable the child, when grown up, to use its mental powers fully and properly; nature study does this and is therefore the common sense of education, for it teaches a child not only to see but also to think. He then described how bad boys in school may be improved. They are generally active and restless, wanting something to interest them and to use their faculties upon; but get them to join in investigating some of the lovely natural objects about them, no matter how common they may be, and a bond of sympathy with the teacher is at once created and their restless spirits find something to expend themselves upon.

Some of the benefits of Nature study are that it compels people to realize that everything in a state of nature is absolutely perfect and beautiful; it leads the student to become habitually neat and methodical in all his work; it promotes habits of care and accuracy; it insists upon

all observations being absolutely truthful ; it inculcates a spirit of reverence and tends to make better men and women. Not only in the æsthetic side, but also in the economic and practical side is its study valuable, for it must be of great use to know what insects are beneficial, and which injurious, and what plants are noxious weeds to be got rid of or useful for some special purpose. In Manitoba a practical instance of the value of Nature study can be found. There the children are taught in the schools to know the common weeds and plants of the country. In every school thirty of the commonest plants to be found on the neighbouring farms are brought in for study, and these necessarily include several weeds. The children are taught that there are three kinds of plants, those that live one year, two years or many years and that of the last kind there are two classes—the deep and the shallow rooted ; that plants, like animals, must eat and drink, and that they do so by means of their roots ; and therefore, that if the roots are exposed to the sun and wind they starve and die. The result already is that the most troublesome weeds are known and recognized throughout the length and breadth of the Province, and the farms are now much cleaner than they formerly were. Some such plan ought to be adopted here, and great benefits would, in a few years, result from it. The attention of our children should be directed, not only to plants but to birds, insects, wild animals, anything in a state of nature that may be found in their own neighbourhood.

Dr. Fletcher then spoke in warm terms of the great blessings we enjoyed in this Province, the excellence of our climate, the fertility of our soil, our freedom from devastating cyclones, the absence of serious epidemics, our admirable liberty with just laws to punish the evil doer, and then drew the moral that we should use every effort to train up our children to be worthy of such an inheritance, and to be fitted for the development and utilization of all our splendid resources.

He then delighted the audience by an exhibition of lantern slides of plants, insects, and other natural objects, respecting each of which he gave clear and concise explanations as they were thrown upon the screen. The following are some of the objects exhibited : Plant lice, canker worms, codling moth, scale insects, cabbage butterfly, spruce gall louse, horse bot-fly. sheep tick, luna moth, walking stick insects, pollen, leaf of deutzia, sections of pine, hollow and solid wheat stems, lilac buds and stems, and a stem of corn, yellow columbine, the sundew, Venus's fly-trap, etc.

A cordial vote of thanks was then moved by Mr. J. H. Bowman, seconded by Rev Dr. Bethune, to the Hon. J. Dryden for his kindness in presiding over the meeting ; to Dr. Fyles and Dr. Fletcher for their interesting addresses, and to Principal Merchant for the use of the room, and his valuable services in providing the lantern, and with Mr. Rennie's assistance, manipulating the slides

The Hon. Mr. Dryden, in acknowledging the vote of thanks, said that he had been much benefitted by his visit. His Department and the Entomological Society went hand in hand for the country's good, and each recognized the value of the union ; he hoped that their mutual interest would never flag.

The meeting then adjourned.

Thursday, November 14th, 1901.

The Entomological Society resumed its sessions at 11 a.m., the President, Rev. Dr. Fyles, in the chair. The first order of business was the reading of the Director's Reports on the Insects of the year, which were followed by remarks and discussions participated in by several of the members. After the Report of the Council had been read, the meeting proceeded to the election of officers for the ensuing year, which resulted as shown on page 2. The reports of the various branches, sections, and officers were read and approved.

In the afternoon a number of valuable and interesting papers were presented, some of them from want of time being read by title only ; rare and beautiful specimens were exhibited ; many

notes and observations were recounted, and when the hour of parting arrived (about 5.30 p.m.) general regret was felt that the sessions could not be continued for another day. All who were present enjoyed the meetings very much, and realized how full of value as well as of pleasure such gatherings are, when men of similar tastes can meet and discuss subjects that to them are of exceeding interest.

The following exhibits were shown by Dr. Fletcher :—A case illustrating the method which had been adopted in the arrangement of the cabinets of injurious insects at Ottawa. Several of the more important injurious insects of the year were shown in all their stages together with some of their parasites.

In two cases mounted specimens were shown of rare or interesting species, amongst these may be mentioned two specimens of *Sphinx Canadensis* taken at Ottawa by Mr. Arthur Gibson. This species bear a somewhat close resemblance to *Sphinx chersis* but has a general tinge of brown over the whole body, as well as different ornamentation on the wings and thorax. *Sphinx Vancouverensis* from Rev. G. W. Taylor, collected at Gabriola Island, B.C.

Heterocampa biundata—a very large and handsome specimen, collected at Ottawa in the middle of June.

H. marthesia—a perfect specimen reared from a larva found at Ottawa in 1900.

Homohadena badistriga—in all stages.

Mamestra atlantica—in all stages.

M. adjuncta—moth and larva.

Datana integerrima—larvae and moths.

Arctia virgo—showing larva with dorsal stripe.

Arctia arge—larva, from D. Brainerd, Montreal.

Alypia MacCullochii—moth and larva, collected at Banff, N. W. T.

Gluphisia severa—larvæ in all stages, and moths. Eggs received from Mr. J. W. Cockle, Kaslo, B. C.

Leucobrephos Middendorfi—2 perfect specimens received from Mr. Norman Criddle, of Aweme, Man.

Arctia phalerata—in all stages showing varieties, including females with yellow underwings.

Neneophila Selwyni—bred from eggs collected at Nepigon, Ont.

Perilroma astricta—moths and the very beautiful larva reared from eggs sent from Kaslo, B. C., by Mr. J. W. Cockle.

Smerinthus ophthalmicus—in all stages from the egg to adult—reared from eggs sent by Mr. J. W. Cockle.

Arctia virguncula—in all stages reared from eggs sent by Mr. A. Kwiat, of Chicago.

Several beautiful specimens of Hydroecias and their work were exhibited. The larvae of these were sent to the Division of Insects by Mr. Henry Bird of Rye, New York, and beautiful specimens for the cabinet were reared and exhibited of the following species : *H. cerussata*, *H. necopina*, *H. marginidens* and *H. impecuniosa*. *H. cataphracta* was bred from Ottawa material, as well as *Achatodes zeæ* in considerable numbers, from the young stems of wild and cultivated elders (Sambucus).

The most interesting butterflies shown were *Erebia Vidleri*, from Mount Cheam, B.C. ; *E. Rossii*, from Telon River, Y.T. ; a specimen of *Pieris protodice* from Ottawa, and a very handsome specimen of the variety *Lintneri* of *Vanessa antiopa* in which the marginal band is $\frac{3}{8}$ of an inch wide at the widest part.

NOTES ON INSECTS OF THE YEAR.

Division No. I.—Ottawa District.—By C. H. Young, Hurdman's Bridge.

When Dr. Fletcher informed me on his return from the annual meeting of the Society in November of last year that I had been elected Director for the Ottawa district, I indeed felt greatly honoured at being appointed a member of the Council of such an important Society.

I regret however that owing to the remarkable absence, from a general standpoint, of all kinds of insects during the past season, that I was unable to make as many observations as I had hoped.

Tent caterpillars which had been so prevalent and destructive of late years in the Ottawa district were very scarce, and although I was on the look out for them, I failed to locate more than one nest—this on a wild plum tree.

The most abundant pest was the White Cabbage Butterfly (fig. 9), which occurred in remarkable numbers near my farm. In fact they were so prevalent at the end of June that they gave a decidedly white appearance to the fields when flying: as if a heavy fall of snow was in progress, or as if many people had torn up handfuls of small pieces of white paper and scattered them at the same time through the air. One of my neighbours had a great quantity of wild mustard growing in his fields, and the larvae were very abundant on these plants, and ate everything except the stems and flowers. They were, of course, very destructive to cabbages, and as soon as my neighbor set out his young plants the female butterflies immediately began to lay eggs on them, which in due course hatched, and the larvae quickly devoured the foliage. I advised my friend in time to dust his plants with pyrethrum insect powder, but as he considered that this was too expensive an operation he did not do anything and as a result lost all his plants. In August the larvae of the later brood were also very prevalent on turnips. I examined numbers of plants and was pleased to notice that a bacterial disease was at work among the larvae, most of them were dead and in a putrid condition.

Fig. 9. White cabbage butterfly—*a*, larva; *b*, chrysalis.

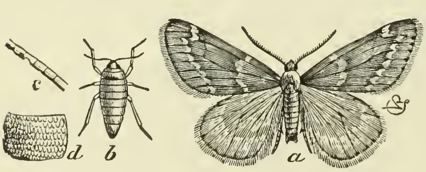


Fig. 10. Canker-worm—*a*, male moth; *b*, female.

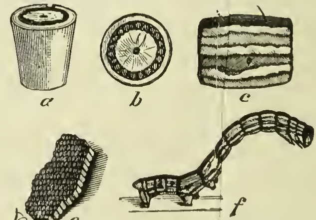


Fig. 11. Canker-worm, eggs and larva.

In the spring of the year Canker-worm larvae (*Anisopteryx pometaria*) (figs. 10 and 11) were very abundant, especially on forest trees. Basswood and beech seemed to suffer most as far as I observed.

From about the middle of August until the early part of September Birch trees of all kinds were badly attacked by the larvae of the Birch Bucculatrix (*Bucculatrix Canadensisella.*) (Fig. 12 shows an allied species which attacks apple-trees.) This attack caused widespread attention and as the larvae were so abundant they soon stripped the trees of their foliage. Towards the end of August the attack was most noticeable, and at this time the leaves were quickly falling from the trees.

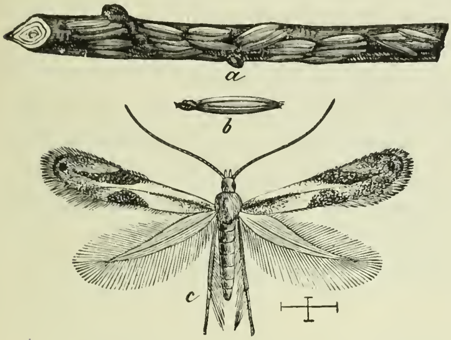


Fig. 12. The apple Bucculatrix (*B. pomifoliella*)—*a*, cocoons on a twig; *b*, a single cocoon; *c*, the moth, greatly magnified.

From the collector's standpoint insects were very scarce in this district during the past season. I, therefore, did not succeed in taking many species which call for special mention. I have during the year continued my work at breeding and inflating larvæ, and the following, which are shown in a case I have brought to the meeting, are some of the species I have raised or collected the larvæ of:—

Papilio turnus—larva, chrysalis and imago; common.

Fig. 13. Philampelus achemon—moth.

Grapta comma—dark and light forms of larva, chrysalis and imagoes. Larvæ were rather common this year on hop.

Philampelus achemon—larva (fig. 14), pupa and imago (fig. 13). This year I collected about 11 larvae on wild Virginian Creeper.

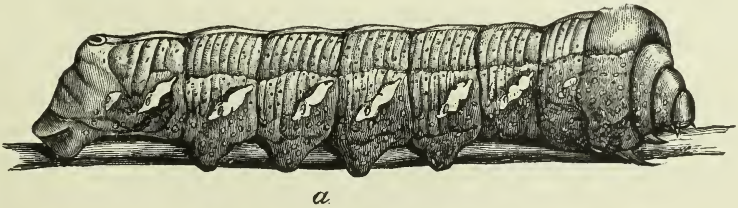


Fig. 14. Philampelus achemon—larva.

Deilephila chamænerii—larva, pupa and imago. Larvae bred from eggs.

Ampelophaga myron—larva, pupa and imago—Larvae uncommon at Ottawa as a rule.

Euprepia caja, var. *Americana*—larva and imago—species rather rare at Ottawa.

Arctia arge—larva and imago—very rare at Ottawa.

Orgyia leucostigma—larva and imago—bred from eggs collected at Toronto.

Parorgyia Clintonii—larva and imago—uncommon at Ottawa.

Euchaetes egle—larva and imago—larvae sometimes abundant on Asclepias.

Semiophora Youngii, Sm. This is a very beautiful Agrotid, the moths of which have been taken on the Mer Bleue, an extensive peat bog near Ottawa, during the past two seasons, and of which several specimens of the larvae were taken nearly full grown at the end of May, 1901, feeding on spruce and American Larch. Larvæ, pupae and imagoes. For a description of this new species see "Canadian Entomologist," vol. xxxiv, page 29, (February 1902).

Arsilonche albovenosa—larva, pupa, imago and parasites. Larvæ common at Ottawa.

Noctua bicarnea—larva and imago—common.

Noctua baja—larva and imago—common.

Noctua clandestina—larva and imago—common.

Mamestra lorea—larva and imago—larvæ common in spring under bark, etc. on the ground.

Hyppa xylinoides—larva and imago—rather common.

Homohadena badistriga—larva and imago—larvæ found on wild honeysuckle.

Abrostola urentis—larva and imago—larvae collected on nettle.

Alaria florida—larva and imago—larvæ occasionally abundant in seed pods of Common Evening Primrose.

Nomophila noctuella—larva and imago—common.

Balsa malana—larva and imago—larvæ on apple.

Division No. 2.—Bay of Quinte.—By J. D. Evans, Trenton.

During the past season very few cases of depredations by insects have come to the writer's notice. *Clisiocampa disstria*, which have been so very destructive in the recent past, were not observable this year, or were so few in numbers as to cause little serious injury.

The only noteworthy instance of a serious attack was that of *Lecanium Fitchi*, the bark louse, on the long blackberry ; they were first observed on the 14th of June. On the 20th, six days following, samples of the canes were brought to the writer by Mr. W. A. Warner ; he stated that he had half an acre of these berries, and his neighbours, a Mr. Arnott had about six acres and a Mr. Higgins 2 acres ; these gardens are situated about two or three miles to the north west of the Town of Trenton. The canes, he said, were literally covered with these insects from a height of twelve or eighteen inches above the ground to the top ; in one instance upwards of 150 were crowded within a space of seven inches on the stem. Bordeaux mixture and whale-oil soap emulsion had been applied but apparently with very little beneficial result. Upon making further enquiries and a personal inspection it was learned that Mr. Arnott was the principal sufferer, the others having very few, if any, of the unwelcome visitors. Several samples of these infested canes were forwarded to Dr. Fletcher of the Central Experimental Farm.

Upon examination with a lens it was seen that the majority of the shells, or cases, were filled with an immense number of eggs of a whitish color, and a few of the cases were tenanted with the larvæ of some insect. At this time the fruit was forming but before it ripened, the canes were swarming with the newly-hatched young, they however vanished without doing any appreciably serious injury to the fruit. After the fruit had been gathered the majority of the old canes were cut down and destroyed by fire ; in a small patch near the dwelling house, however, the old canes had not been cut down and when on the sixth of the present month, (November,) the writer again visited this garden the new canes were found to be infested, but to a much less degree than the past season's bearing canes.

In June last, the writer placed two of the infested stems in a glass jar, covered with muslin, and awaited developments. About the 1st of July, the eggs began to hatch out and the young

appeared in great numbers, about the same time there also appeared three species of Chalcis flies, the larger species appeared first and numbered fifteen specimens in all ; then followed two other species much smaller in size of which there were forty-five specimens of one, and twenty-three of the other. No more of them making their appearance, after a few days, the jar was put to one side and overlooked for a time ; however, on the 11th of August, other prisoners were observed the majority of them being dead but in two or three instances they were alive ; these proved to be *Hyperaspis* four males and seven females of *proba* and one female of *signata*.

When examining the canes on the sixth inst. in Mr. Arnott's garden, it was noticed that some of them presented a peculiar appearance from the ground upwards, as if they were covered with a white fungus, upon close inspection they were seen to be scale insects of a species unknown to the writer, samples of which are herewith presented.

Since presenting the foregoing report Dr. Fletcher has very kindly obtained the names of the parasites, etc.

The small white scale above referred to, found on the blackberry, is the Rose scale (*Aulacaspis rosæ*, Bouché, sometimes called *Diaspis rosæ*). Dr. Fletcher remarks that this is a very bad pest.

The parasitic flies have been identified at Washington, D.C., as follows : No. 1, *Encyrtus* (*Comys*) *fuscus*, How. No. 2, *Aphycus annulipes*, Ashm. No. 3, *Blastothrix* sp.

The following additional species were obtained from the blackberry canes sent from Trenton to Ottawa. No. 4, *Microterys*, sp. male. No. 5, *Coccophagus flavoscutellum*, Ashm. No. 7, *Eustochus xanthothorax*, Ashm. Dr. Fletcher says of this last, "a Mymarid described 15 years ago in Can. Ent. vol. 19, 1887, p. 193. This is an exceedingly minute creature which Mr. Guignard found in sorting out the material" and as reported by Mr. Ashmead, "it is the second specimen seen."

The fungus found infesting the Lecanium Prof. Roland Thaxter says "is evidently an immature *Cordiceps* of some sort, I thought at first *C. clavulata*, but the conidia are not those of that species."

Division No. 4.—Hamilton District.—By James Johnston, Bartonville.

We have had two very troublesome insects in this district this season, the Hessian fly (*Cecidomyia destructor* Say.) and the potato beetle (*Doryphora 10-lineata* Say).

The work of the Hessian fly was so great as to entirely ruin whole fields of wheat. I have seen fields that looked well and promising last fall and in the early spring so badly ruined as to render them not worthy of being harvested. The early sown fields were where the flies seemed to work the most destruction. The folks on this farm were so discouraged that they have sown rye instead of wheat this fall as a means of checking them.

About the beginning of June the general complaint was about the ravages of the potato beetles amongst the tomato plants. During my experience this has been a record year for these pests. One morning in early June four of us started to put out tomato plants where no beetles were to be seen, but after dinner they were so numerous on the plants set out that we had to leave off planting and turn to hand-picking the beetles. We found from one to thirty-seven on individual plants, so that an idea can be formed of our task of going over 18,000 plants, a task that had to be repeated for several days. If they would show themselves our work would not be so extensive, but the plagued things hide themselves away under lumps of earth when not feeding, so that it is necessary to be daily on the lookout for them.

The following are the only insects new to this district that I have to report for this year :—

As early as February a specimen of *Anthrenus scrophulariae*, Linn., was brought to me from a neighbor's house and later on I came across several.

Sept 28th *Crioceris asparagi*, Linn., (Fig. 15) made its first appearance on our asparagus, when I secured six specimens.

Oct. 10th I took a fine fresh specimen of *Pyrgus tessellata*, Scud. (Fig. 16). Saw another the week previous but failed to secure it.

In the discussion which followed upon the reading of the Directors repoits, Dr. Fletcher referred to the little black Lady-beetle, *Pentilia misella*, in Canadian orchards, and said that while it is an object of great interest from its habit of preying upon the San José scale, it cannot be relied upon as of any great value for the destruction of the scale. It is still absolutely necessary to apply practical remedies and not wait for this little insect to perform the work.

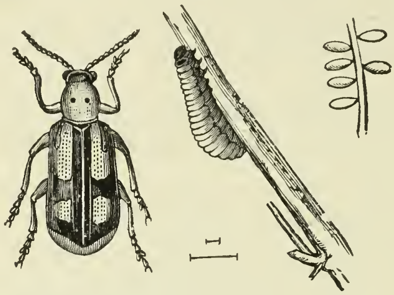


Fig. 15. Asparagus beetle, larva and eggs.

Fig. 16. Pyrgus tessellata.

Prof. Webster said that the *Pentilia* was increasing in abundance in Ohio, but only late in the fall did it become numerous ; the winter following reduced its numbers to such an extent that it took all the next season for it to recover its numbers, and consequently it was not of much help as a remedy for the scale. The Colorado potato beetle had been very bad on tomatoes in Ohio this year

Dr. Fletcher said that it had also attacked tobacco grown in gardens at Ottawa. In speaking of the cabbage butterfly he recommended the Pyrethrum insect powder as the best means for destroying the larvæ ; it would be much too dangerous to apply Paris green to a vegetable that was afterwards to be brought to table.

REPORT OF THE COUNCIL.

The Council of the Entomological Society of Ontaiio begs to present its Annual Report for the year 1900-1901.

The thirty-seventh annual meeting was held in London in November, 1900, and was well attended both by resident members and those from a distance. On the first evening a joint meeting was held with the Horticultural Society in a lecture room at the Normal School. The chair was taken by Prof. C. C. James, Deputy Minister of Agriculture for Ontario, who delivered an interesting address on the value of horticulture in its various aspects and its intimate relation with Entomology. Mr. W. E. Saunders followed with a paper on "The planting, care and pruning of the trees in the parks and streets of the city," and Dr. James Fletcher gave an address, illustrated with lantern pictures, on trees and their methods of growth and on some especially injurious insects. The two following days were occupied with the reading of papers and reports, a discussion on the San José scale and the transaction of the business of the Society. A full account of the proceedings has been published and distributed.

The thirty-first Annual Report on Economic and General Entomology was presented to the Minister of Agriculture for Ontario in December last and was issued from the press in the following February. It contained 112 pages and was illustrated with forty-six figures in the text and a photogravure portrait of Mr. J. Alston Moffat, who has been the efficient curator and librarian of the Society for upwards of ten years. In addition to an account of the proceed-

ings at the annual meeting, it included among many useful and practical papers the President's address by the Rev. Dr. Fyles, in which he described the importance of insects in the fertilization of plants ; papers by Prof. F. M. Webster on the codling-moth, the use of crude petroleum against scale insects, some species of Dermestidæ and two longicorn beetles affecting nursery stock ; by Prof. W. Lochhead on forest insects, the San José scale, the squash bug, and the silk industry in Ontario ; by Mr. Moffat on Anosia Archippus and Parasites in the eggs of Chrysopa ; by Dr. Fyles on the Dragon flies of Quebec ; by Dr. Fletcher on the injurious insects of 1900 in Ontario ; notes on insects of the year by the Directors, Messrs. Evans, Cox, Johnston and Rennie, and by Mr. Moffat ; and papers by Messrs. Gibson, Gregson, Nash and Dearness. An abstract was given of the proceedings at the annual meeting of the Association of Economic Entomologists, and a short report of the second annual meeting of the North-west (Canada) Entomological Society.

The *Canadian Entomologist* has been regularly issued at the beginning of each month. The 32nd volume was completed in December last ; it consisted of 387 pages, illustrated with thirty-three figures from original drawings and seven full-page plates. The contributors numbered sixty-four and included well-known Entomologists in Great Britain, Germany, Switzerland, South Africa, Brazil and Mexico, as well as in the United States and Canada. The 33rd volume will be completed next month ; the eleven numbers thus far issued contain 316 pages and several original illustrations.

The Index to the thirty annual Reports of the Society, 1870 to 1899, was published in January last, and is for sale at a nominal price. To those who have occasion to refer to the Reports it must be of very great value.

Meetings for the study of Entomology were held during the winter, the order Coleoptera being taken as the portion for consideration. The Geological and Ornithological Sections have held regular meetings throughout the year, the Microscopical Section during the winter months, after which the Botanical Section took its place. Public lectures of a popular character were given by Dr. Bethune on Entomological subjects before the London Horticultural Society, the Canadian Horticultural Association, and the Young People's Societies connected with the Bishop Cronyn Memorial Church and the South Wellington Street Methodist Church. Mr. W. E. Saunders also delivered lectures on the Birds of Canada, illustrated with lantern pictures, at the High School, Montreal, and before several teachers' meetings and church societies. One field meeting was held at Komoka on the 13th of July, and a goodly number of botanical and entomological specimens were obtained.

The Council desires to place on record its high appreciation of the services of Mr. J. A. Balkwill, who has filled the office of honorary treasurer for the last nine years and has now found himself unable to continue in the position. His books have been kept with great neatness and accuracy, and his attention to the business of the Society has always been prompt and satisfactory. Thanks are also due to Mr. Moffat, the Curator and Librarian, who has been indefatigable in his care of the library and collections, and has shown a constant zeal and interest in the welfare of the Society.

The Council here places on record its great appreciation of the scholarly and valuable work of the Editor of *The Canadian Entomologist*, the Rev. Dr. Bethune, who during the last thirty-eight years has been doing useful service for the advancement of entomology, not only in Canada but throughout North America.

The Council, in common with entomologists everywhere, deeply deplores the loss of Miss Eleanor A. Ormerod, one of our honorary members, who died on the 11th of May last. Her work in economic entomology has proved most valuable to husbandmen, gardeners and others in Great Britain and of much interest to scientific students in all lands.

All of which is respectfully submitted.

THOMAS W. FYLES, President.

REPORT OF THE MONTREAL BRANCH.

The 232nd regular and 28th annual meeting of the Montreal Branch of the Entomological Society of Ontario was held at the residence of Mr. A. F. Winn, 58 Bruce avenue, Westmount, on the 14th of May, at 8.30 p.m. The members present comprised Messrs. A. F. Winn (President), Dwight Brainerd, G. Chagnon, M. W. Davis, J. B. A. L. Leymarie, Henry H. Lyman, G. A. Moore, A. E. Norris, C. Stevenson, and L. Gibb.

The chair was taken by the President, and the minutes of the previous meeting and the last annual meeting were read and confirmed.

The President then submitted the following report of the Council for the past year :—

Your Council have pleasure in presenting the following report of the Society's work during the season 1900-1901 :

Eight regular monthly meetings have been held, the average attendance being ten.

A field day was held at St. Hilaire, on May 24th, which was a very successful and enjoyable outing.

The following papers were read at the meetings :—

Life History of *Euchætes Oregonensis*........................ Henry H. Lyman.
Note on the Emergence of a Gall Insect........................ A. F. Winn.
Notes on the Past Season (1900)........................ A. E. Norris.
Methods of collecting Lepidoptera........................ H. H. Newcomb.
Notes on Walker's Types of *Spilosoma congrua*........................ H. H. Lyman.
Danais Archippus........................ J. B. Williams.
A Fortnight at Biddeford, Maine........................ A. F. Winn.
Ephestia Kuhniella........................ Dwight Brainerd.
Notes on Hybridity of Lepidoptera, Papers by Miss Morton, Newburgh, N.J., and H. H. Newcomb, Boston, read by the President.
Notes on the Larvæ of *Scopelosoma Morrisoni S. tristigmata*, and
Description of the Larvæ of *S. Graefiana*........................ H. H. Lyman.
Entomological Chemistry........................ C. Stevenson.
Life History of *Vanessa Antiopa*........................ A. E. Norris.
Commercial Entomology........................ C. Stevenson.
A Query Regarding the Death of Insects........................ A. F. Winn.
Pædisca Scudderiana........................ Dwight Brainerd.
Notes on *D. archippus*........................ H. H. Lyman.
Among the Lycænæ in England........................ L. Gibb.

Two new members, Messrs. J. B. A. L. Leymarie and E. Denny, have been added to our roll, but we have also lost, through the sudden death of Mr. E. T. Chambers, one of our most regular attendants at the meetings. Mr. I. B. Williams has moved to Toronto where he will, doubtless, join the Toronto branch. Dr. Wyatt Johnston and H. N. Cowan have resigned.

The book-case ordered for us is in place in the library of the Natural History Society : the few books in it will form a nucleus for a future collection of literature on our favourite subject.

The subject of the formation of a general collection of insects for our Branch was given a good deal of time and attention, and it was unanimously decided to make a beginning. A dozen drawers and a case of sufficient size to contain thirty have been ordered, and we hoped to have had the cabinet ready for donations before to-night's meeting ; such would have been the case but for the death of Mr. Priddy of Toronto, who had the order.

The work on this case is being completed and word of its shipment is expected any day. The members are especially requested to do their best to make the collection as perfect and

useful as possible. Through the kindness of Miss Morton we have already received a fine collection of Hybrid Attaci.

The report of the Treasurer submitted herewith shows that we still have a considerable balance to our credit.

Respectfully submitted on behalf of the Council.

(Signed) A. F. Winn,
President.

The Librarian then made his report, and it was moved by Mr. Charles Stevenson, seconded by Mr. G. A. Moore, that the reports of the Council, Treasurer, and Librarian, be received and adopted. Carried.

The Treasurer submitted his report, shewing a balance on hand of $48.90.

The President then read his annual address.

The following officers were elected for the ensuing year ;—

President...G. Chagnon.
Vice-President...C. Stevenson.
Librarian and Curator ....A E. Norris.
Treasurer and Secretary...................................G. A. Moore.
Council..Henry H. Lyman.
A. F. Winn.
Dwight Brainerd.

Moved by Mr. A. E. Norris, seconded by Mr. C. Stevenson, that a regular meeting be held in June this year.

Moved by Mr. G. A. Moore, seconded by Mr. J. B. A. L. Leymarie, that a field day be held at Beloeil on the 24th inst. Carried.

Mr. A. F. Winn moved, seconded by Mr. M. W. Davis, that a committee on outings for the summer be formed to consist of Messrs. G. Chagnon, C. Stevenson, and A. F. Winn. Carried.

Mr. L. Gibb exhibited a number of Lepidoptera collected in the Yukon in the season of 1900.

After the examination of specimens and discussion, the meeting adjourned.

G. A. Moore,
Secretary.

REPORT OF THE QUEBEC BRANCH.

At an adjourned meeting held at "Darnoc," the residence of James Geggie, Esq., on the 22nd June, 1901, the President gave an address, the Report of the Council was made, and the officers for the current year were chosen, as follows :

President's Address.

We have now entered upon the fifth year of our Association as a branch of the Entomological Society of Ontario.

Since the formation of the Branch we have had many happy gatherings in which conversations have been held and papers read upon the subject of animal and vegetable life and upon the beauties and wonders displayed in the natural objects around us. We have, moreover, enjoyed much social intercourse and many delightful visits to places of interest in the neighborhood of Quebec. Not a few choice specimens of natural objects have been taken by our collectors.

It is hoped that the season we have now entered upon will be as fruitful in pleasant associations as those that have gone before, and that our Branch will continue to flourish.

Among the subjects that during the past year have engaged the attention of practical entomologists have been :—

1. The increased destructiveness of, and the preventives against, that most injurious creature, the San José scale. Professor Lochhead, of the Ontario Agricultural College, has issued a valuable paper upon this pest.

2. Much thought and ability have been brought to bear by Dr. Howard, of Washington, upon the mosquitoes and the danger that exists of the conveyance of disease by them from fever patients to healthy persons. The subject is one of very grave importance.

3. The subject of the Green Pea Aphis was brought under the notice of the members of the Entomological Association at its last annual meeting by Dr. Fletcher. The Green Pea Aphis is a pest that is doing much damage to the pea crops. It has been found destructive along the Atlantic coast, in some of the Western States and in parts of Canada. Several references to it are to be found in the Society's last annual report and will be found interesting.

4. The question as to the practicability of the cultivation of silk in this country has been considered. Professor Lochhead has looked carefully into the subject and has come to the conclusion that, although the climate of Ontario is suitable for silk-culture, and the Osage-Orange, a fitting food-plant for the silk-worm, can be freely grown, there is one great preventive to the introduction of the industry, viz., the lack of cheap labour. This is such that it is thought our people could not compete with the foreign growers.

I think the subject shou'd not be allowed to drop but should be further looked into, for, during the fiscal year, ended June 30th, 1899, silk and silken goods to the value of $3,752,539, were imported into Canada, and upon them duty amounting to $1,091,218.49 was paid.

It may be interesting to learn that our Quebec people indulged in silk handkerchiefs during the year to the value of $24,489 and in silk hosiery to the value of $1,174. In this respect they exceeded the Ontario people who only expended $939 ; but they fell short of the people of British Columbia who laid out $1,875 in silken foot-wear.

In sewing and embroidery silk, Quebec expended $8,700, more than one-half the expenditure of the whole Dominion, which speaks well for the industry of its ladies in certain directions.

An important work well done has been issued by the society, viz :—a " General Index to the Thirty Annual Reports of the Entomological Society of Ontario, 1870-1899, prepared by Rev. C. J. S. Bethune, D. C. L., Editor of the *Canadian Entomologist* ". The cost of this useful compilation to members is 25 cents per copy unbound and 50 cents bound in cloth.

Our branch has suffered from the loss by death and removal of some of its members. It is hoped that new additions will keep up our numbers.

Report of Council.

The branch now includes 42 members (33 adults and 9 juniors).

The Treasurer's Report is submitted and will no doubt be found satisfactory.

The continued rainy weather of last summer prevented the members from having many field-days but two very enjoyable ones were held on the 16th June and 14th July.

Our thanks are due to the authorities of Morrin College for having continued to allow us the use of their rooms for our meetings.

Crawford Lindsay,
Secretary-Treasurer.

The following were elected officers :—President— Rev. Dr. Fyles, Vice-President—Miss E. MacDonald, Council—Hon. R. Turrer, Mrs. R. Turner, Mr. J. H. Simmons, Miss Bickell, Miss Winfield, Mr. James Geggie.

Lt. Col. Crawford Lindsay,
Secretary-Treasurer.

REPORT OF THE TORONTO BRANCH.

The fifth annual meeting of the Toronto Branch of the Entomological Society of Ontario was held in the Education Department Building, on Friday evening, May the 10th, 1901.

Present; Messrs. Cox, Webb, Williams, Smith, Rossiter and Stewart. The President, Mr. D. G. Cox, in the chair. The minutes of the previous meeting were read and approved. The Secretary read the following Report of the Council.

The Council of the Toronto Branch of the Entomological Society of Ontario take pleasure in presenting the fifth Annual Report of the proceedings of the Branch for the year ending 30th March, 1901.

They are pleased to report that since the last annual meeting six new members have been admitted. As an offset to this four members have withdrawn.

During the year eight regular meetings have been held in the Education Department. At three of these papers have been read, viz :—

"On the Inflation of Larvae"............................Arthur Gibson.
"The Colours of Insects"...................................G. M. Stewart.
"Aquatic Insects"..E. M. Walker.

It is hoped that more papers will be presented by the members during the coming year. Much discussion has been held on entomological matters, and a number of specimens have been exhibited.

A large part of the time of the meeting has been devoted to the collection of insects, which the Branch is preparing for the Ontario Education Department, and some headway has been made. The Orthoptera, the Coleoptera, and the Diurnals among the Lepidoptera have been classified. Many donations of specimens have been received for the collection, notably some Haitian Lepidoptera from Mr. Cox, and it is hoped that the members will collect for it as largely as possible during the coming season.

Many valuable papers have been received from various sources, notably the Cent. Exp. Farm, Ottawa, the Ohio Agricultural Experiment Station, the New York Agricultural Experiment Station, the United States Division of Entomology, the Cornell University Insectary, and the Chicago Entomological Society.

The Society also subscribes for the "Journal of the New York Entomological Society," and for the "Entomological News."

The Treasurer's report shows a small balance carried forward on the right side.

Respectfully submitted on behalf of the Council,

D. G. Cox,
President.

Mr. Cox then addressed the meeting, speaking of the work of the Society, and the means by which this work might be improved in the future.

The election of officers for the ensuing year resulted as follows :—

President..Mr. D. G. Cox.
Vice-President..Mr. E. M. Walker.
Secretary-Treasurer.....................................Mr. J. B. Williams.
Librarian and Curator...................................Mr. Geo. Rossitor,
Members of Council.....................................Mr. J. H. Webb.
Mr. Arthur Gibson.

Mr. Cox asked for the opinion of members as to the admission of foreign specimens into the collection of insects. All the members were of the opinion that foreign specimens should be included, as they were included in the other branches of the museum.

It was decided to hold a Field Day in High Park on the 24th of May. The meeting then adjourned.

G. M. STEWART, Secretary.

REPORT OF THE LIBRARIAN AND CURATOR.

For the Year Ending 31st of August, 1901.

Thirteen bound volumes were received from Governments, Societies and Scientific Institutions during the year.

Two were obtained by purchase, one of which is the Century Atlas of the World.

One was presented to the Society by the Rev. Dr. Bethune, making sixteen bound volumes altogether.

Fifteen volumes were bound and placed on the shelves, making a total of thirty-one volumes added to the Library during the year.

The full number of volumes now on the register is 1,722.

Thirty-three volumes were issued to local members during the year.

There have been few additions made to the native collection during the past season, and nothing of special importance has been reported as having been taken in this locality.

An important addition was made to the exotics by the receipt of a collection of Japanese beetles; many of them being large and attractive specimens. A small collection of West African insects was presented to the Society by Mr. T. H. Hill, who has recently returned from that region, where he was engaged in missionary work for about seven years.

Respectfully submitted,

J. Alston Moffat.

AUDITORS' REPORT FOR THE YEAR ENDING AUGUST 31st, 1901.

Receipts.		Expenditure.	
Balance on hand, September 1st, 1900	$492 71	Paid for pins, cork, etc.	$60 09
Sales of pins, cork, etc.	72 12	Expense account (postage, etc.)	139 14
Advertising	31 85	Printing account	717 55
Sales of Entomologist	151 97	Annual meeting and report	163 28
Government grant	1,000 00	Library account	42 09
Members' fees	395 04	Salary account	375 00
Interest	11 51	Rent	175 00
		Balance, August 31st, 1901	483 05
	$2,155 20		$2,155 20

We, the Auditors of the Ontario Entomological Society, have examined the books of the Treasurer, compared them with vouchers and find them correct, and certify that the above is a true statement.

James H. Bowman, } Auditors.
W. H. Hamilton, }

REPORT OF THE MICROSCOPICAL SECTION.

The Microscopical Section of the Entomological Society of Ontario beg leave to present their annual report as follows :—A meeting for the purpose of re-organizing was held on February 22nd, 1901, when the following officers were elected :

Chairman . . . . Dr. Bethune.
Secretary . . . . E. A. Brown.
Committee . . . . John Dearness. J. A. Bowman. R. W. Rennie.

On account of the lateness of re-organizing, only four meetings were held, with an average attendance of eight, as well as visitors.

During the season four papers were read —

(1) Microscopical Examination of Crystals................J. H. Bowman.
(2) Microscopical Examination of Bacteria................R. W. Rennie.
(3) Dermestes..J. Dearness.
(4) Pond Life..J. H. Bowman.

Besides these short notes on interesting subjects were read, and many very interesting slides of microscopic plants, crystals and insects were examined.

The Section gave an entertainment by request in the school-room of the Bishop Cronyn Memorial Church ; an address on "Mosquitoes and Malaria" was given by Dr. Bethune, followed by an exhibition of microscopical objects by Messrs. Bowman and Brown ; the attendance was large and all were greatly interested.

Charles J. S. Bethune, Chairman. Edgar A. Brown, Secretary.

REPORT OF THE BOTANICAL SECTION.

The re-organization meeting of the Botanical Section of the Entomological Society of Ontario was held on May 4th, 1901, when the following officers were elected :—

Chairman..R. W. Rennie.
Vice-Chairman...................................Dr. C J. S. Bethune.
Secretary.......................................E. A. Brown.

Eight meetings were held during the summer, commencing May 11th, and every alternate Saturday evening thereafter, with an average attendance of seven, besides visitors. A very pleasant and profitable field-day was spent at Komoka on July 13th. At each meeting interesting subjects were discussed, and objects of interest reported. Six papers were read, viz. :—

(1) The Study of Botany with the Camera...........R. W. Rennie.
(2) A Trip to Sable Island.........................W. E. Saunders.
(3) Pond-net (Hydrodicton Utriculatum).............J. H. Bowman.
(4) Collecting Native Orchids......................Dr. C. J. S. Bethune.
(5) Hydra..J. H. Bowman.
(6) Fungi..John Dearness.

R. W. Rennie, Chairman. Edgar A. Brown, Secretary.

REPORT OF THE ORNITHOLOGICAL SECTION.

The year has been marked by a vigorous prosecution of Ornithological work, though not by any growth in the membership. Two regular meetings were missed on account of uncontrollable circumstances, and one extra meeting was held in July. At the nine meetings held a total of thirty-two members were present, averaging less than four to each meeting.

Three of these meetings were spent informally in the examination of the collections of Messrs. Keays, Gould and Saunders, and at the remaining six meetings ten papers were read as well as a number of shorter notes on interesting subjects. The papers read were as follows :

"The Acadian Owl in Captivity," F. Norman Beattie, Guelph.

"Concerning Woodpeckers," Robert Elliott, Bryanston.

"The Birds of Algoma," Rev. C. T. Scott, London.

"The Extinction of the Elk," and "The Woodcock's Love Song," L. H. Smith, Strathroy.

"The Buff-breasted Sandpiper," Dr. G. A. McCallum, Dunnville.

"Humming Birds," "The Grasshopper Sparrow," and "Notes on Sable Island," illustrated by skins and the very rare nest and eggs of the Ipswich Sparrow, as well as other birds, photographs and curios from the Island, W. E. Saunders, London.

"The Habits of the Saw-whet Owl," Wm. H. Moore.

Five of these papers have appeared in the *Ottawa Naturalist*, one in *Forest and Stream* and the remaining four will probably come out in the *Naturalist*.

Three new birds have been recorded for the county in which the members of the section reside, namely: The Glaucous Gull, the Golden Eagle and the King Eider Duck. Short notes on each were written, and two of these have already been published in the *Ottawa Naturalist*, and the two former specimens were exhibited at the Section's meetings.

The migration lists for the year have been compiled, shewing a large number of species noted in their migrations by members.

A list of the birds of Middlesex County is in course of preparation and may be completed during the coming year.

The Opossum, a mammal not recorded in recent years in Ontario, has been noted in two places, one specimen having been taken near Port Colborne, and two at Rond Eau. The occurrences have been duly noted at the meetings.

Mr. Robert Elliott has identified a skull of a local skunk as *Chincha putida*, the Eastern skunk. The official skunk for northern Ontario from Nipissing to Rainy River is the Canada skunk, *Chincha mephitis*, which we have yet to find.

Interesting discussions have, of course, taken place on many subjects recorded on the minutes but not referred to in this report.

During the past year addresses and demonstrations have been given on Ornithological subjects to teachers and other assemblies by members of the Section as follows: By Mr. W. E. Saunders to the Teachers' Association meeting at Easter; the Boys' Club of St. James's Presbyterian Church; the Epworth League of the Wellington Street Methodist Church; a farmers' meeting at Derwent, Ont.; a lecture, illustrated with lantern slides, on the Birds of Canada, at the High School, Montreal, under the auspices of McGill College; the same lecture was repeated in London at the First Methodist Church, the First Baptist Church and to the Epworth League of the Dundas Centre Methodist Church. By Mr. H. Gould to the teachers of the Lorne Avenue Public School and to the Kindergarten, Lorne Avenue, London.

J. E. Keays, Chairman.
W. E. Saunders, Secretary.

REPORT OF THE GEOLOGICAL SECTION.

The Geological Section of the Entomological Society of Ontario begs leave to present its annual report.

Meetings were held weekly throughout the year, excepting the usual summer vacation. Geological studies were actively prosecuted and field work was done in several localities in the south western peninsula. Amongst other places visited were Grand River Valley, near Galt; 2, Sydenham Valley at Alvinston; 3, Corniferous and Hamilton formations in Bosanquet. The specimens obtained were placed upon the table and after study went to increase the various collections of the members os the Society.

The Chairman of the Section made interesting reports upon his trips to the locations above named. For the first time the Corniferous strata has been made a special study, being fully exposed by operations having in view the drainage of lands adjacent to Mud Creek, which empties into the Sauble, near Port Frank. Fine specimens of Orthoceras from two to three feet in length were found, many being broken by explosives used in blasting away the rock. A very perfect specimen, one foot long, was shown to the class. Spirifers of larger size (Spirifer striatus) were found very abundantly in beds of clay above this formation, also a number of other fossils, Murchisonia being the chief.

Because of the great excess of silica the use of the rock is very much restricted, being too hard and too fragile and also containing iron, which makes it un-suitable for building purposes. This is in decided contrast to the formation exposed at St. Mary's, where the Corniferous is remarkably free from silica and contains an abundance of fossils of the Devonian Period and occasionally the remains of fossil fishes are found.

The Hamilton formation immediately overlies the Corniferous at Arkona, where it is exposed by the Sauble River. This vicinity is well known as one of the finest collecting grounds in the world. Many distinguished scientists have visited the Sauble Valley, amongst others Prof. Hall, New York ; Prof. Winchell, Ann Arbor, and many others Geologists of lesser note. Here trilobites abound, the characteristic species being Phacops Bufo. Fossil corals, also of great beauty and variety, completely silicified, are found here and Crinoids in vast abundance.

In visiting this section a geologist may leave his hammer at home and come provided only with baskets or an express wagon which he would have no difficulty in filling with these ancient fossil remains. Specimens from this district have been shipped to many museums in Great Britain and United States. The Academy of Natural Science in Philadelphia was this year presented with a small collection of local specimens by the Chairman of the Section who thus advertises Ontario in an efficient way. When our city sees fit to establish a museum we have at our doors a rich field in which to secure a very varied collection suitable for studying the Paleontology of this district and which also may be used for exchanges.

After being Chairman of the Geological Section since its inception, excepting one year when Professor Andras occupied it, Dr. Wolverton has now resigned in favor of Mr. Kirk, a capable and energetic member of our section.

The following reports will be placed in the hands of the Editor :

Roads and Road-making .... Mr. Kirk.
The Galt Dolomites .... Mr. Goodburne.
Methods of Concentrating Gold .... Mr. J. G. Smith.
The Mastodon of Mount Brydges .... Mr. J. G. Smith.

[The report on "Roads and Road-making" has already been published elsewhere.]

The Galt Dolomites.

Limestone is perhaps one of the most abundant of all minerals, and the most widely distributed, quartz alone excepted. It appears in very many different forms, the ordinary one of limestone being best known, with marble as the most valuable, and these two show the extremes of the substance—one the original material and the other the metamorphic condition. Limestone is composed of carbonic acid, 44 ; lime, 56 ; but carbonate of iron or magnesia may take the place of a portion of the carbonate of lime. A very large amount of our limestones, however, are properly dolomites, which differ from the limestone in the process of deposition, and in chemical structure. Dolomite consists of carbonate of lime, 54.35 ; carbonate of magnesia, 45 65 ; these including a small portion of protoxide of iron (FeO) or magnesia. Dolomites are calcareous, and appear to have been simple chemical precipitates, and in some cases to have originated from the alteration of limestone rocks by magnesia salts.

Water containing free carbonic acid (derived from decaying vegetable matter) dissolves a portion of carbonate of lime, but the bicarbonate thus formed is easily decomposed, even by mere exposure to the atmosphere and a precipitation of calcareous matter takes place. In this manner the calcareous tufas of our swamps, (notably at Komoka), together with stalactites and stalagmites are produced, and similar processes on a large scale have deposited the strata in ancient seas and lakes. All limestones effervesce in acids ; but the dolomites effervesce only feebly, unless the acid be heated. In some parts of Canada dolomites abound, but I think they are best shown along the Grand River from Elora to Galt, at Guelph on the Speed, and at some places in Dumfries. It is of several shades, commencing at the top with a yellow color, and becoming lighter and semi-crystalline about 50 feet lower ; while about 100 feet from the top of the series the rock is almost white, and granular in texture—a most beautiful stone. Some thin beds are of a pale brown, still retaining the granular appearance. Between the semi-crystalline and granular textures there is, in some places, a thin band of rock which will powder in the fingers, and seems to be principally sulphate of magnesia. This, however, only appears in places. The dolomites yield excellent building stones, especially in the semi-crystalline series, while the granular layers are chiefly burned for building lime. In fact, the lime produced from these rocks is renowned for its excellence, becoming extremely hard with age, and it is doubtful if as fine a quality can be produced from any other class of limestone. The dolomites of the Guelph series are placed in the Onondaga Salt group of the Upper Silurian, which derives its name from Onondaga, near Syracuse, N. Y. In Canada the Onondaga deposits attain between 200 and 300 feet in thickness, and consist of thin-bedded dolomites, with greenish shales (chiefly argillaceous dolomites), and some masses of gypsum. The latter does not occur in regular beds, but in lenticular masses. The dolomites above the gypsum are generally arched and more or less fissured, while those on which the gypsum rests retain their horizontal position.

This Guelph formation is peculiar to Ontario, its rocks not having been traced beyond the limits of the province. It follows the western limits of the Niagara, and occurs as a bean-shaped mass, gradually thinning out westward toward Lake Huron, and eastward near Ancaster. Its greatest thickness is about 160 feet. Its principal exposures are at the places I have already mentioned. Along the Grand River it frequently presents vertical cliffs 80 feet high.

The fossils contained are small in variety, and most of them are identical with those belonging to the Niagara beds, as Favosites gothlandica and Halysites catenulatus, but others appear to be confined to this formation. As a general rule the fossils are somewhat obscure, and for the most part not very abundant. The most characteristic fossil, and one peculiar to this formation is the Megalomus Canadensis, usually found in the form of internal casts, and I will confine my attention to this fossil.

The Megalomus belongs to the Lamellibranchiata, or conchifera order, which are marine or fresh-water animals of the acephalus (headless) type. In the adult condition they have laminated gills or branchiæ for breathing purposes, and they secrete a bivalve external shell. The two valves are nearly always of equal size, but always more or less inequilateral. (A line drawn straight through the middle of an equilateral shell, divides it into two equal parts.) These mollusks are exceedingly abundant in the fossil state, though not so numerous as the brachiopods in older rocks. The existing species, both marine and fresh-water, number about 3,000, but about double that number of fossil forms have been found, which belong to many successive periods, and it is very probable this is only a very small portion of the Lamellibranchiate fauna of the past.

In their classification these mollusks fall into two leading sections and four groups ;—

1. Asiphonida.
   - (a) Pleuroconcha.
   - (b) Orthoconchæ.

2. Siphonida.
   (a) Integro-Pallialia.
   (b) Sinu-Pallialia.

The animals of the first section are without the respiratory tubes possessed by the Siphonida, and it is with this first section that we have to do.

The first group, Pleuroconcha, rest in their natural position with one valve *below* and the other *above*. They have but one large muscular impression in the centre of each valve, which forms a shallow pit, occupied by the muscle which keeps the valves closed. An example is the oyster and Ambonychia radiata of the Hudson River Group, Lower Silurian.

The second group, or Orthoconcha, are without siphonal tubes, but their valves are *right* and *left*, instead of upper and under, as regards its normal position, and the muscular impressions are two in each valve. The most remarkable of this genus is the Megalomus Canadensis, of Hall, which occurs in great numbers in the Guelph formation, principally in the form of internal casts, very few specimens showing the original shell.

The Meg. compressus of Nicholson, is allied to the M. Canadensis. It is smaller and more compressed ; the umbones are more prominent, and the pallial line more distinct. Other fossils include many varieties of the Murchisonia, and these examples on the table are M. Loganii.

All these specimens are, however, internal casts only, very few having been found presenting the outer shells, and in the case of Megalomus, scarcely anything is known of its outward appearance. The filtration of water and the presence of carbonic acid in the dolomite have destroyed the organic matter of the shell, and left the cast of the interior. There is a great quantity of water in these rocks, saturating the stone heavily in the lower portions, which, when freshly quarried, is quite soft, becoming very hard on losing a portion of the water on contact with the atmosphere. Some of the quarries contain few fossils, others are full of them, and while one quarry may produce good specimens, the majority from others are of scarcely any use for cabinet purposes. Some fossils are also found in the gravels, but are very badly worn.

J. L. GOODBURNE.

METHODS OF CONCENTRATING GOLD.

There are two methods of concentrating gold—by means purely mechanical and by chemicals. For the efficient separation by the former process innumerable appliances have been invented whose fundamental principle is in nearly every case based on the great specific gravity of gold.

For separating low grade gold ores an interesting appliance has recently come into general use in Western America. It consists of an endless rough-flanged belt passing over two pulleys, one slightly lower than the other, thus giving the upper surface of the belt. Near the lower wheel the pulverized ore is deposited and is carried upward by the revolving belt which meets a stream of cold water. This carries off the quartz, leaving the gold adhering to the rough belt whence it is later deposited in settlers.

Cyaniding and Chlorination have of late received much attention from mining men. The former particularly is made use of in a great majority of up-to-date mills.

The ore is crushed to a pulp before cyaniding and thrown into cyanide vats, after which a solution of cyanide of potassium is added to dissolve the finer particles of gold. The solution is drained off into " zinc " tanks filled with zinc clippings, where the zinc displaces the gold and the metal is deposited with the zinc slimes whence it is easily recovered by retorting.

In chlorination it is not necessary to crush the ore so fine. It is also roasted before being passed to chlorination vats to break up all sulphides. After the barrel is charged with the required amount of chloride of lime and sulphuric acid it is revolved slowly from three to eight hours, when the gold solution is drawn off through a filter into lead-lined settling tanks. From this the gold may be obtained by SO_2 H_2S or by the charcoal method.

The cyaniding process, while it will not save more gold than will chlorination, possesses the advantage of saving from 70 to 80 per cent. of the silver values in an ore as well and hence is in more general use.

J. G. SMITH.

THE MASTODON OF MOUNT BRYDGES.

During the summer there was found on the estate of Mr. Duncan Forbes of Mount Brydges the jaw of a Mastodon. The find occurred several feet below the surface in a peat bog.

The jaw weighs 54 lbs., and is 30 inches long by 24 inches wide, by 18 inches high. It differs from the jaws of living animals in its great massiveness—a section through it almost forming a circle. The exterior is black in color and of a hard dense structure, being apparently filled with infiltrated iron.

The jaw contains four teeth—two on either side—none in front. The row on either side is about three inches wide by ten inches long. The front teeth contain three rows of nipples and the rear four rows.

A loose tooth was found to weigh one pound and a half. The teeth exhibit a remarkable degree of preservation, as the enamel remains as it was when the animal died. The tops of the nipples are notched by wear, show the hard black dentine beneath. From their appearance the animal would seem to be herbivorous.

The front of the lower jaw shows a peculiar structure as though it had contained tusks or teeth during the animal's lifetime.

(The finders attempted to reach other parts but have been so far unsuccessful.)

J. G. SMITH.

REPORT FROM THE ENTOMOLOGICAL SOCIETY OF ONTARIO TO THE ROYAL SOCIETY OF CANADA.

THROUGH THE REV. C. J. S. BETHUNE, D.C.L., DELEGATE.

When a society has attained to mature age, like an individual it cannot be expected that its thirty-seventh year should be marked by any great crisis or any striking event. It is natural, therefore, that the representative of the Entomological Society of Ontario should be able to present to the Royal Society of Canada only a report of quiet work and steady progress since our meeting a year ago.

The thirty-seventh annual meeting was held in November last at London, the headquarters of the Society. The opening proceedings were rendered notable by the joint meeting which was held with the recently organized London Horticultural Society. It was held in the splendid new building of the Normal School and was attended by a large and appreciative audience, representing both the Societies and the general public as well. It was presided over by Prof. C. C. James, Deputy Minister of Agriculture for Ontario, who delivered an address on the value of Horticulture in its various aspects, its intellectual advantages and its attraction for persons of literary tastes. He was followed by Mr. W. E. Saunders, of London, who read a paper on "The planting, care and pruning of the trees in the parks and streets of the city," which is a matter of much importance in a place whose beauty and attractiveness largely depend upon the noble avenues of trees in the streets, and the parks secured to the public by a wise and rare forethought. Dr. Fletcher, Dominion Entomologist and Botanist, then gave an address, illustrated with beautiful lantern pictures, and showing how trees should be grown and treated and the admirable results that have been obtained at the Experimental Farms at Ottawa and in the North-west. He also took up the subject of insects and described a large number of the most destructive species and the remedies that may be most successfully employed against them.

The afternoon of the following day was chiefly taken up with a discussion on the San José scale in Ontario. Mr. G. E. Fisher, Provincial Inspector, who was present by direction of the Minister of Agriculture, gave a full account of the prevalence of this most pernicious insect in several localities, and of the experiments which had been undertaken in order to procure, if possible, a practical remedy. Whale oil soap and crude petroleum were the principal applications employed, and while the former was not entirely effective, the latter was regarded by many as too dangerous a remedy for general use. Dr. Fletcher, Prof. Webster and others took part in the discussion. The attack is believed by all to be a most serious one, and to require prompt and effective measures for its repression.

The 31st annual report of the Society to the Legislature of Ontario was presented at the opening of the last Session and published in February. It consists of 112 pages, illustrated with forty-six engravings in the text and a photogravue portrait of Mr. J. Alston Moffat, for many years past the devoted Curator and Librarian of the Society. The volume contains reports from the various officers and sections, and from the flourishing Branches at Montreal, Quebec and Toronto. There is appended also an account of the second annual meeting of the North-west (Canada) Entomological Society, which has its headquarters in Alberta.

During the winter and spring fortnightly meetings for the study of Entomology were held on Friday evenings, and alternately with them the Microscopical Section held its sessions; much serious work was done in both departments and great interest was shown by the members. The Geological Section met weekly on Tuesdays under the guidance of Dr. Woolverton. and the Ornithological Section once a month at the residence of Mr. W. E. Saunders, one of the most devoted and well-informed bird lovers in the Province of Ontario. The Botanical Section has been in abeyance for a time, but is now being revived with every prospect of success. From this brief account it will be seen how wide a range of country the Society's operations cover and how many departments of natural science are included in its work.

In the report to the Legislature there are published the papers read at the annual meeting, among which may be mentioned the Presidential address of the Rev. Dr. Fyles, who took for his subject the offices served by insects in the promotion of the fertilization and improvement of plants. He gave an interesting and instructive account of a large number of plants and their attendant insects, and illustrated his remarks with a series of beautiful diagrams of the structure of numerous flowers, the work of his own hand.

Professor Lochhead, of the Ontario Agricultural College, read papers on "The systematic and economic study of forest insects in Ontario," setting forth the necessity of endeavouring to diminish the ravages of insects in addition to the work of protection against fire already undertaken by the Provincial Government; "The silk worm industry in Ontario," which has been begun on a small scale in the County of Essex but which the Professor contends cannot be made a lucrative occupation in this country; "The present status of the San José scale in Ontario;" "Nature-study lessons on the squash bug," intended for the use of school teachers; and an account of the "Insects of the season of 1900," which had proved especially injurious in the south-western peninsula of Ontario.

Mr. J. Alston Moffat contributed papers on "Anosia Archippus yet again," in which he discussed the various theories set forth regarding the migrations of this remarkable butterfly; "Parasites in the eggs of Chrysopa;" and "Notes on the season of 1900," enumerating some interesting occurrences, among which may be mentioned the capture in London of specimens of the curious Myriapod, *Cermatia forceps*, a southern creature which has been gradually working its way to the north.

Professor F. M. Webster, of Ohio, one of our honorary members who takes an active interest in the Society and attends its annual meetings, read papers of much practical value on "Results of experiments in protecting apples from the Codling moth," referring especially to

the injury wrought by the second brood ; "Results of some applications of crude Petroleum to orchard trees," setting forth the danger of its use and the necessity for a much larger series of experiments before it can be recommended as an insecticide to the ordinary fruit grower ; "Two Longicorn Beetles affecting growing nursery stock," viz: *Saperda vestita* and *Oberea bimaculata*, which, though very familiar insects, have not been suspected of making attacks of this kind ; and "Observations on several species of Dermestidæ," a family of beetles well-known for their habits of feeding on museum specimens and many household articles, but not hitherto recognized as phytophagous also.

Dr. James Fletcher, Dominion Entomologist and Botanist, gave a very full account of the Injurious insects in Ontario during 1900," and described the attacks on cereals, fodder crops, roots and vegetables, and fruits, many of which were of a very serious character. Mr. Arthur Gibson, assistant Entomologist at the Central Experimental Farm, described the methods which he had found most successful for "The breeding of Lepidoptera and inflation of larvæ," illustrating the latter subject with some very beautiful specimens that he had prepared.

Reports on "Insects of the Year" were furnished by four of the Directors, Messrs. J. D. Evans, Trenton ; D. G. Cox, Toronto ; James Johnston, Bartonville ; and R. W. Rennie, London. The performance of this duty by these officers of the Society is of much importance as it brings together information regarding the chief insect attacks of the year in the various sections of the Province.

The Rev. Dr. Fyles contributed a descriptive paper on "The Dragon-flies of the Province of Quebec," and short papers were read by Mr. J. Dearness on "A parasite of the San José scale ;" Mr. C. W. Nash, "Notes on Danais archippus at Toronto ;" and Mr. P. B. Gregson on "Curious habits of the larvæ of *Dermestes talpinus*." The last named gentleman also furnished an account of the proceedings at the annual meeting of the North-West (Canada) Entomological Society.

The volume also contains a synopsis of the most important papers read at the meeting of the Association of Economic Entomologists, which are of great interest and much practical value.

The funds of the Society are shown by the Treasurer's statement to be in a satisfactory condition. The Librarian reports valuable additions of books and specimens, the number of the former on the shelves being almost 1700. The membership of the branches at Montreal, Quebec, and Toronto has steadily increased, and that of the whole Society grows from year to year. All interested in its welfare have much reason to be pleased with its continued success, and the valuable scientific and practical work which is being performed by its members.

The Annual Report, whose contents have just been described, records the practical observations and work of the Society ; for the scientific and systematic department reference must be made to the monthly magazine, "The Canadian Entomologist," the thirty-third annual volume of which is now being published. The volume for 1900 consists of 387 pages, and is illustrated with seven full-page plates and thirty-three figures from original drawings. The contributors number sixty four, and represent Canada, the United States, Mexico, Brazil, Great Britain, Germany, Switzerland and South Africa. As there are upwards of a hundred articles, besides short notices and book reviews, it would occupy too much space to mention the subject of each. They may, however, be grouped as follows :

Papers on Classification : North American Yponomeutidæ and Tineidæ, by Dr. H. G. Dyar ; the Wasps of the Super-family Vespoidea, and changes in generic names of Hymenoptera, by W. H. Ashmead ; the Genus Orchelimum, by Jerome McNeill ; the Genus Catocala, by Prof. G. H. French ; Notes on Idiocerus (Jassidæ), by C. F. Baker ; the North American species of Choreutis and its allies, by Prof. C. H. Fernald ; New Mexico Bees of the Genus Cœlioxys, by Prof. T. D. A. Cockerell ; Colorado Bees, by E. S. G. Titus ; some species of Acronycta in the British Museum, by Prof. J. B. Smith ; the Types of Noctuid Genera and a series of papers

on the Classification of Butterflies, by Prof. A. R. Grote ; some Genera of Mites, by N. Banks, and the Bibliography of Coccidæ, by G. B. King.

New genera, species and varieties have been described in the Lepidoptera by the late Rev. G. D. Hulst, Dr. Wm. Barnes, Rev. Dr. Fyles, G. M. Dodge, Miss Murtfeldt, W. Beutenmuller, Prof. J. B. Smith, Prof. C. H. Fernald and G. A. Ehrman ; in the Hymenoptera, by Prof. T. D. A. Cockerell, C. Robertson, W. H. Ashmead, Dr. L. O. Howard and A. D. MacGillivray ; in the Diptera by D. W. Coquillett, C. W. Johnson, A. L. Melander, J. S. Hine and Prof. G. H. French ; in the Orthoptera by Dr. S. H. Scudder ; in the Hemiptera (Homoptera) by J. L. Handcock, C. F. Baker, E. D. Ball, Prof. H. Osborn, Adolph Hempel, Prof. T. D. A. Cockerell, Prof. J. D. Tinsley, E. M. Ehrhorn, G. B. King and E. E. Bogue ; in the Hemiptera (Heteroptera) by A. N. Caudell, and in the Arachnida by N. Banks. Twenty-seven new genera are described and 213 new species and varieties.

Interesting and valuable life-histories of various insects are given by Dr. J. Fletcher, A. Gibson, Dr. H. G. Dyar, H. Bird, J. O. Martin, E. D. Sanderson and Dr. L. O. Howard. Papers on collecting and other observations of insects are given by W. Knaus, E. F. Heath, J. A. Moffat, Rev. Dr. Fyles, H. H. Lyman, J. G. Needham and A. J. Snyder.

In economic Entomology there are important papers by C. P. Lounsbury on Insect Bites and their effects ; T. Pergande on a Plant-louse injurious to Violets ; Prof. F. M. Webster on the Purslane Saw-fly, Harpalus caliginosus as a Strawberry Pest and the Diptera found in wheat fields ; Prof. W. G. Johnson on the Destructive Pea Aphis, and Prof G. H French on a Fly causing Epilepsy.

In addition to the foregoing publications, a General Index to the thirty Annual Reports of the Society (1870 to 1899) has been prepared by the editor, Rev. Dr. Bethune, and published by the Ontario Department of Agriculture. It is very full and complete and will prove of much value to all who have occasion to refer to these volumes.

INJURIOUS INSECTS OF THE SEASON OF 1901.

By Prof. W. Lochhead, Ontario Agricultural College, Guelph.

Affecting Farm Crops.

In the south-west portion of the Province the wheat crop suffered severely from the attacks of the Hessian fly. In several counties the yield per acre was very much reduced, notwithstanding the plowing under of a large area both in the fall and spring.

So urgent was the demand for more information regarding the life-history and habits of the pest, that a bulletin was published by the Department of Agriculture in August, and distributed freely throughout the infested areas. This bulletin emphasized the great need for co-operation among the farmers themselves, if they ever hoped to cope with the fly. Late sowing, good preparation of the land to be sown to wheat, and trap-strips, will be found effective if all the fields are treated alike ; but if some fields are sown early and become infested with the fly in the fall, there is no way of preventing the flies which emerge from these fields in May from migrating to uninfested fields and damaging them before harvest.

Orchard Insects.

As in previous years, the codling worm (Fig. 17). was the most destructive orchard insect, especially in the sections where the insect is double-brooded. A word of warning may be given here, lest owners of orchards become lax in the matter of spraying with Paris green immediately after blossoming, while attempting to entrap the second brood by bandages. We can never afford to give up spraying with Bordeaux and Paris green, for by doing so the codling worm and fungus diseases are kept in check. The frequent rains about the blossoming period interfered with the spraying operations, and when the applications were not renewed, the effect of the Paris green was very slight indeed.

In connection with the bandages, I find that sacking is the best material for bandages. It is the cheapest as well as the most easily applied and removed. Success with bandages requires careful attention to them every two weeks. They should be removed from the trees and examined for cocoons, then replaced. It is next to impossible to examine the burlaps thoroughly without removing them from the tree.

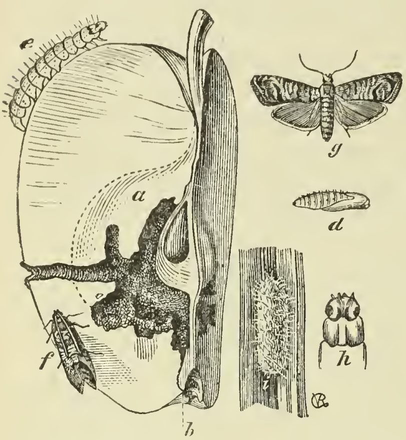


Fig. 17. Codling moth. Quarter of an apple shewing the injury caused by the worm (*a*); the moth (*f* and *g*); chrysalis (*d*); larva (*e*), its head and first segment (*h*); cocoon (*i*). Riley.

The Haseltine trap lanterns were kept burning nearly every night from June 7th to September 7th, to ascertain the kinds of insects that are attracted to such lights. The results are somewhat startling on account of the capture of a large percentage of decidedly beneficial insects. For example, 30 per cent. of all the forms taken were Ichneumon flies; nearly 2 per cent. were Lady beetles and Ground beetles; $2\frac{1}{3}$ per cent. were Dung beetles; 3 per cent. were Mosquitoes and Crane-flies; 1 per cent. Fireflies. Sixty per cent. of the whole number taken were composed of injurious forms, such as May beetles, Squash bugs, Cabbage worms, Cucumber beetles and moths. The strangest thing in connection with the trap lantern experiments was the complete absence of Codling moths. It is evident that as a means of capturing Codling moths, these trap-lanterns are a decided failure.

The Potato Stalk-Borer.—(*Trichobaris 3-notata.*)

Under date of Sept. 14th, Mr. J. A. Auld, M.P.P. for South Essex, wrote me regarding a serious insect attack of the potato vines on Pelee Island, and sent samples of the dying stalks. These branches were widely tunnelled from the base to near the tip. The potato crop will be a partial failure this year and the loss wlll be serious. In 1900, Pelee Island shipped 30,000 bushels of potatoes, but in 1901, there will be few bushels to spare.

The cause of the trouble is a small snout-weevil (Fig. 18, *c*) which deposits its egg in the stalk some time in late May or early June. A small white grub (Fig. 18, *a*) hatches from the egg, and begins at once to tunnel the centre out of the stalk. It is then nearly half an inch in length, with whitish body and brown head, and legless. It constructs within the tunnel a rude cocoon out of fibres or clay within which it changes to a pupa, (Fig. 18, *b*.) The pupal stage probably does not last longer than two weeks, for in the same stalk I found grubs, pupæ and adults. The adult beetle remains in the vines all winter according to Dr. J. B. Smith.

The only outward appearance of the presence of a pest is the premature blackening of the stalks, and consequent wilting; but when the stalks were handled, and pressure applied, they collapsed more readily than would normal plants.

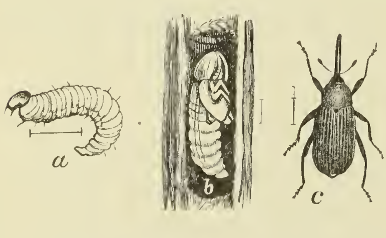


Fig. 18.—Potato Stalk-borer; *a*, grub; *b*, pupa; *c*, beetle.

Although this Borer is well-known in many parts of the Western States, in Iowa, and Nebraska, for example, this is the first record of its presence in Ontario as a destructive potato insect. Fortunately remedial treatment is both simple and practical, from the fact that the adult remains in the vines over winter. If the vines are gathered and burned as soon as possible after the potato harvest, the majority of the adults will be destroyed.

Asparagus Beetles.

Attention was called in my Notes of the last two seasons to the progress of the two species of Asparagus beetles westward from the Niagara river. In 1899 they had reached St. Catharines; in 1900 nearly to Hamilton. This year they were present in the Asparagus beds at the O. A. C. farm in considerable numbers. I have not heard of their appearance in places west of Guelph, but undoubtedly they are *Westward, Ho!* and are bound to join hands with their brothers in Michigan.

At the College the Twelve-spotted species (*Crioceris 12-punctatus*, fig. 19) was by far the

Fig. 19. Crioceris 12-punctatus.

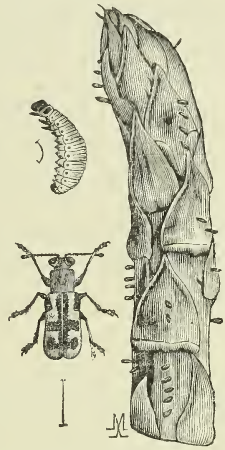


Fig. 20. Crioceris asparagi: beetle, grub, and eggs on plant.

more abundant, and it is apparently leading the other species (*C. asparagi*, fig. 20) in its march through Ontario.

About St. Catharines the beetles did much damage. They appeared in such numbers on the tender shoots and disfigured them so much that the shoots were unmarketable. They seemed to gnaw the epidermis as the shoot was peeping above the ground, before it was ready to cut for market.

It is probable that when greater attention is given to the destruction of the beetles after the spring cutting is over, fewer beetles will hibernate and give trouble in early spring.

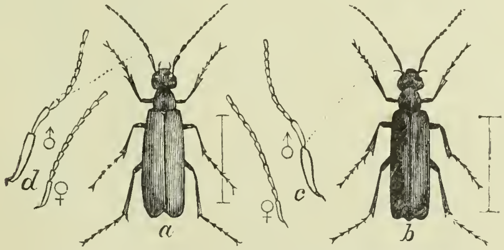


Fig. 21. Blister Beetles—*a*, Epicauta cinerea; *b*, E. Pennsylvanica.

Fig. 22. Epicauta vittata.

Blister Beetles.

These insects were numerous the past season, and in some sections "alarm was beginning to be felt." Three species were common, viz., *Epicauta Pennsylvanica*, *Epicauta cinerea*,

and *E. vittata.* Of these *Epicauta vittata* was perhaps most commonly seen. All are rather soft-bodied insects, and may be distinguished by their color. *E. Pennsylvanica* (fig. 21 *b*) is uniformly black; *E. cinerea* (fig. 21 *a*) is blackish with grey streaks along the margins of wing covers and middle of thorax; and *E. vittata* (fig. 22) yellowish with black stripes. The striped species was present in large numbers on beet crops; the ash-colored species on vetch, horse beans, lucerne, and the black blister beetle on Golden Rod.

When the life-history of blister beetles is studied it is found that their larvæ prey upon grasshoppers, and hence are beneficial. A question, therefore, arises: "Should we destroy the beetles and try to lessen their numbers?" It must be understood that the more adults we kill the fewer larvæ will develop to destroy the egg-pods of grasshoppers, and the greater the number of grasshoppers appearing the following season. When these factors are borne in mind there is good reason for allowing the adult beetles to feed unmolested. They never remain long enough to do much serious injury. They usually appear in large numbers for a week or ten days, but they disappear as suddenly. It is a matter of observation that blister beetles are more numerous than usual the season following one when grasshoppers were very abundant.

Before the advent of the Colorado Potato Beetle these blister beetles were the "potato beetles." In many districts in the northern part of the province they are still the "potato beetles."

Plant Lice.

Plant lice, or Aphids, (Fig. 23), were more abundant than usual this past season. The early spring with its moist, cloudy weather was strongly in favor of their rapid development; and among the more common forms that did considerable mischief were the Cherry Aphis (*Myzus cerasi*), Apple Aphis (*Aphis mali*), Plum Aphis (*Aphis prunicola*), Currant Aphis (*Myzus ribis*), the Rose Aphis, and the Grain Aphis. As Aphids are sucking insects, that take their nourishment in the form of plant juices through a slender tube, arsenical poisons on the plants have no effect. Frequently the presence of a few plant lice in the early part of the season is altogether neglected, when a little trouble at that time would practically exterminate them. Many persons are unwilling to believe that from a few Aphids tens of thousands of them will develop before July. Huxley once computed that "the uninterrupted breeding of ten generations of plant-lice from a single mother would produce a mass of organic matter equivalent to that of 500 million of human beings." As Dr. Howard remarks, this great productiveness is due more to the early age at which the Aphids begin to reproduce, rather than to any extreme prolificacy.

The majority of the generations or broods produced during the summer are wingless, but at intervals winged broods occur. This is very probably a provision for the distribution of the species. The last brood of the season is a winged one, composed of both males and females. Soon after mating the males die, while the females perish after the deposition of the eggs.

Plant-lice have possibly more enemies, which feed upon them, than most other injurious insects. These enemies are Lady-birds, Braconids, Aphis lions, maggots of Syrphus-flies, and certain other dipterous maggots. All of these kill immense numbers of Aphids, and in some instances exterminate them, but in most cases extreme rapidity of development more than counterbalances great mortality.

The Currant Aphis (*Myzus ribis*).

Although never a serious pest, this Aphis disfigures and renders unsightly the leaves of currants. Attention is here called to it on account of the many inquiries

regarding the purplish swellings or blister-like elevations on affected leaves, which make their appearance in May. In the concavities on the under surface will be found clustered large numbers of Aphids, both winged and unwinged, all busy sucking the juices from the leaf.

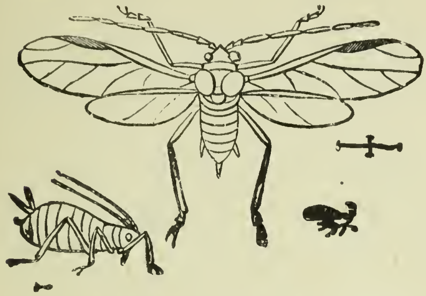


Fig. 23. Plant-lice (Aphis) winged and wingless (much enlarged).

It is seldom that these Aphids are troublesome after midsummer.

Prompt picking of affected leaves, or applications of Kerosene Emulsion, whale oil soap solution, or Gillett's Lye, are the best methods of dealing with Currant Aphis.

CHERRY APHIS (*Myzus cerasi*).

During June the cherry trees in many sections became badly infested with plant-lice (*Myzus cerasi*). The leaves of the large terminal twigs were chiefly affected. They became much distorted, and discolored by a fungus feeding on the honey-dew, and with excrement ; and then became inrolled with the Aphids feeding within. The effects on the leaves are detrimental to the growth of the tree, inasmuch as much nourishment intended for the development of the tree is taken by the plant-lice within their own bodies.

These Aphids are shining black insects. They frequently multiply so very rapidly that the smaller leaf-stalks and twigs become completely covered with them. The leaves and branches near by become very sticky from the abundance of honey-dew excreted.

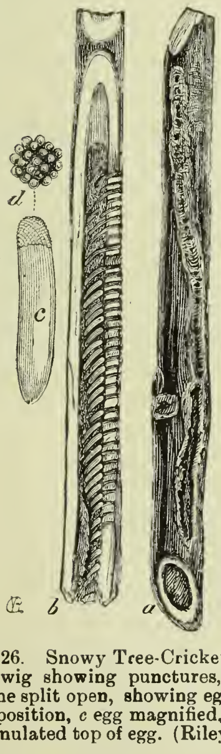


Fig. 26. Snowy Tree-Cricket, *a* twig showing punctures, *b* same split open, showing eggs in position, *c* egg magnified, *d* granulated top of egg. (Riley)

Enemies of the Cherry Aphis are usually present, and kill an astonishing number, sometimes almost ridding the trees.

The life-history of the Cherry Aphis is similar to that of other Aphids which appear on many cultivated plants. They winter over in the egg-stage ; in early spring the eggs hatch ; and a brood of females appear, which produces living young at a rapid rate on the Cherry up till July, when they disappear. Although not definitely proved, it is probable that the lice migrate to the roots of the Cherry, and to other plants. In autumn, a brood of winged males and females make their appearance. After mating, the females deposit eggs for the winter about the buds of the Cherry.

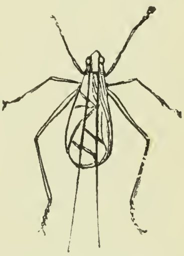


Fig. 24. Snowy Tree-Cricket, male.

Treatment, to be effective, must begin early, before the Aphids roll the leaves around themselves ; otherwise they are difficult to kill. Kerosene emulsion, tobacco solution and whale-oil soap solution are all good.

(10 lbs. of tobacco waste are thoroughly soaked in water ; and the solution is made up to 40 or 50 gallons. Dr. Fletcher recommends the addition of 1 lb. of whale-oil soap to the barrel of tobacco solution).

Fig. 25. Snowy Tree-Cricket, Female.

Some Bush-Fruit Insects.

By bush-fruits I mean red raspberries, black raspberries, currants, and gooseberries.

Perhaps more inquiries were made regarding injuries done to bush-fruits than to any other horticultural crop. Fortunately under careful management and treatment most of the insects can be kept under control.

The Snowy-Tree Cricket (Œcanthus niveus). Figs. 24 and 25. Although the work of this insect is readily recognized, yet too many of our gardeners are unacquainted with it. The female in autumn deposits her elongated cylindrical eggs in punctures in rows (Fig. 26), which are nearly vertical on the erect canes. The result is a long, ragged wound, which interferes materially with the growth of the cane. The remedy is to cut out and burn the wounded portions before the eggs hatch in the spring.

The Raspberry Cane Maggot.—In June frequent complaints were made regarding a wilting of the tips of raspberry canes. The pith of the canes was burrowed from the tip downwards for a short distance, then the inner bark was girdled, producing a wilting of the tip. The portion of the stem burrowed is of smaller diameter than normal, and is of a dark blue color. The affected canes usually die, for the maggot continues to tunnel its way downward to the base.

The cause of the mischief is a two-winged fly belonging to the genus *Phorbia.* From observations made in 1891 by Dr. Fletcher, and in 1896 by Prof. Slingerland, it would appear that the girdling commences early in May, and the maggot reaches the base in June. In the case of the specimens sent from Hespeler on June 11th, the maggot had not then reached more than half way to the base.

The eggs are deposited in early spring at the base of the tip leaves. The insect winters over in the pupa stage at the base of the plant.

The remedy in this case also is to remove the wilting tips as soon as noticed, and burn them.

The Pale Brown Byturus.—During June the flowers and flowerbuds of raspberries suffered severely from the gnawing attacks of small, hairy, yellowish-brown beetles. The injured buds scarcely ever develop fruit for the reason that the stamens and pistils are destroyed.

Later in the season when the eggs have hatched, the grubs damage the nearly full-grown berries. When full-grown, the grub becomes a pupa in the earth, where it remains all winter.

The remedy for the Byturus is to spray with paris green and lime solution.

The Raspberry Cane Borer.—On July 1st, Mr. W. N. Hutt, B. S. A., of Southend, sent me specimens of red-raspberry canes which were punctured by this cane-borer. The tips of the young shoots were wilted, and drooping. The rows of punctures around the cane, and the hole between the rows in which the egg is laid were quite evident, as well as characteristic. The grub on hatching from the egg bores downward in the pith, and reaches the root by autumn. There it transforms into a pupa and rests all winter.

The Rose-Chafer.

(*Macrodactylus subspinosus*).

Usually this beetle confines its attacks to roses and grape, and often does much injury to the blossoms. Last June, however, it began eating the half grown peaches in two large orchards near Niagara-on-the-Lake, and considerable alarm was created lest it should spread to neighbouring orchards. The alarm was occasioned by the presence of immense numbers of the Chafers, and by the knowledge that arsenical poisons were of little use in such an emergency. As many as eight or ten chafers were found feeding on a single peach, and but few peaches were left untouched.

It is probable that the most available remedy at the time is to jar the Chafers from the trees in early morning into receptacles, or on sheets where they may be killed. The operation should be repeated on several successive mornings until the danger is over.

The sudden appearance of the Chafers in immense numbers is accounted for by the habits of the larvæ, which feed on the roots of grasses in sandy locations. In the same locations the pupæ are formed, but when the adults emerge, usually all about the same time, they betake themselves to the most convenient orchard or vine-yard. A line of investiga ion lies open in this connection. If the feeding grounds of the larvæ were discovered and ploughed in spring, while the insects are in the pupal condition, many of them would be destroyed.

The life history is as follows: The female Chafer deposits her eggs in the ground in late June or early July. These hatch in a few weeks, and the grubs feed on the roots of grasses till October, when full-grown they descend still further beyond the reach of frost. In May, they become pupæ, and in June the adults emerge.

THE OAK-PRUNER (*Elaphidion villosum*).


Fig. 27, The Oak-pruner.


Fig. 28, The Oak-pruner larva.

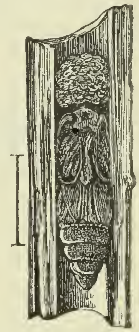


Fig. 29, The Oak-pruner pupa

The work of this beetle (Fig. 27) is so interesting that it deserves some mention here. Under date of July 30th, the Hon. Justice Osler, of Osgoode Hall, wrote me an accurate and interesting account of the work of this Borer in breaking off branches of Oak, as observed on some islands in the Georgian Bay, near Parry Sound. At a later date the same gentleman favored me with specimens of the work of the insect from which I was able to get the larvæ (Fig. 28). Mr. Osler writes: On a tree affected by it will be seen the ends of branches hanging down, and leaves brown and dead. Examination shows that they have been deeply sawn through, remaining attached by a bit of the bark. Opening the end of the drooping branch in July or August, a very lively Borer is found in the shape of a fat, whitish grub, who has closed up the passage at his rear by his saw-dust. He does not appear to work backward, towards the trunk of the tree. Near where his life work appears to have begun, which is at the junction of some leaf or smaller branch, are often seen one or two small, hard, semi-cylindrical cases, about the size and shape of the common 'Lady-bird,' empty, but probably the harbor in which the egg was laid which produced him."

The habits of this beetle are described in greater detail by Dr. Saunders in "Insects Injurious to Fruit," pp. 31, 32; and by Dr. Packard in the "Fifth Report of the Entomological Commission," pp. 83-89. It is not only injurious to the oak but also to the beech, chestnut, birch, hickory, peach and apple. Dr. Saunders calls it "The Apple Tree Pruner."

Attention may be directed here to the wonderful instinct which the insect undoubtedly possesses. The female deposits an egg in an angle of a leaf stalk, near the tip of the twig. The grub, on hatching, feeds on the soft, pulpy pith, until it reaches the branch, when it gnaws the harder, woody tissues, and begins tunneling the branch to its base. Then the sawing process occurs. "This," Dr. Fitch says, "is a most nice and critical operation, requiring much skill and calculation, for the limb must not break and fall while he is in the act of gnawing it apart, or he will be crushed by being at the point where it bends and tears asunder, or will fall from the cavity where it breaks open and separates. To avoid such casualties, therefore, he must, after severing it, have time to withdraw himself back into his hole in the limb, and plug the opening behind him before the limb breaks and falls." With the eye of a trained woodman, he "cuts the limb asunder so far that he supposes it will break with the next wind which arises and withdraws himself into his burrow, and that he may not be stunned and drop therefrom, should the limb strike the earth with violence when it falls, he closes the opening behind him by inserting

therein a wad formed of elastic fibres of wood." Usually his sawing is so accurate that he has not long to wait before he falls with the limb. After the branch has fallen the grub continues to eat and grow. It changes to a pupa (Fig. 29) sometimes in the fall, but usually in the spring. The adults appear in June, the female to lay her eggs as already described.

March Flies (*Bibio*).

Under date of May 29th, a correspondent at Weston sent me three specimens of Bibio. He says :—"Yesterday our beds were infested by an immense quantity of flies,—eating Pansy buds, and also the flowers." At other dates also, reports have been received regarding the supposed damage to plants by these flies ; but although I have invariably at the time asked for specimens actually seen injured by the flies, I have never received any. It is hardly likely that these flies injure the buds and blossoms, although the maggots are known to attack the roots of grasses. The usual food of the larvae, however, is decaying vegetable matter.

In the discussion which followed upon the reading of this paper Prof. Webster referred to the Hazeltine Moth-trap, which he denounced as a perfectly useless affair and recomended that the Canadian government should impose a duty of $5.00 on everyone imported into this country in order to prevent its introduction, 40,000 had been sold in the United States this year and the owners expected to sell 50,000 next year. He had yet to learn that it had caught any codling moths, or at any rate more than a very few, though it professed to exterminate them in the orchard where it was placed.

The Potato Stalk-borer he had found destructive to tomatoes and egg-plant as well as potatoes, near Lake Erie. The 12-spotted asparagus beetle had not yet been found in Ohio, but was evidently spreading rapidly. For the Rose Chafer he could not advise poison, as no poison had been found to kill it, it would eat those in ordinary use and apparently thrive on them. It can however, be destroyed on fruit-trees by using a can with some coal-oil in it attached to the end of a pole and knocking off the beetles into it with a light rod ; this can best be done early in the morning when they are not so active as in the heat of the day. It breeds in sandy soil which is not very dry, and forms its pupa there ; the least disturbance of the soil by cultivation will kill it out.

Mr. Moffat presented an acccount of the death of a woman at St. Thomas which was supposed to have been caused by the bite of an insect. He had obtained the specimen from the doctor in attendance and exhibited it to the meeting. It proved to be the well-known ground beetle, *Galerita Janus*, Fabr., which is usually found under stones in moist places and is classed among beneficial insects. As this beetle was found in the patient's bed four days after she was taken ill, it seems incredible that it should have had any connection with the blood-poisoning, which began in the patient's face so many days before, and terminated fatally.

NOTES ON THE SEASON OF 1901.

By J. Alston Moffat, London.

After an unusually severe January, February and March a favorable opening of spring was anticipated, but in that we were disappointed in this locality. April was cold until near the close, when we had a few warm days, which had a marked effect on insect life, and brought forth *Hymenoptera* and *Diptera* in profusion, whilst the hibernated butterflies enjoyed the bright sunshine immensely, and the small blues came out in numbers. May was decidedly disappointing. For although it brought forward vegetation rapidly, it was quite too cool to pro-

mote the development of the larger forms of Lepidoptera, so that the lilac blooms passed without the appearance of sphinges and other moths that usually attend their attractive feast. June 1901 was reported to be the coldest June experienced in a great many years. But on the 24th it took a turn, and a hot term followed, which lasted for five weeks without a break, with such extreme heat as will have impressed itself on the memory of those who passed through it for the rest of their lives. Such peculiar weather conditions had the effect of disarranging the usual appearing of common forms of insects. Some came out sooner than usual, others were late in showing themselves, and others failed to put in an appearance at all, whilst a few kinds were extremely abundant.

Never before have I seen *Aphides* so prevalent, they were out in all their kinds and colors, on root and branch, and in such masses. But to make amends the lady bird larvæ were noticeably numerous, and no doubt this was the cause of their greatly reduced numbers at the end of the season. The potato beetle was late in appearing, but was in more than usual abundance later on. The imported cabbage butterfly remained scarce until the late summer broods

Fig. 30 —The Yellow Swallow-tailed Butterfly (*Papilio turnus*)

appeared. *Papilio turnus* (Fig. 30), the yellow swallow-tailed butterfly, appeared early and stayed late. It was seen about the middle of May, and was not wholly absent in the middle of August. A long continued period on the wing, which I have often seen but cannot account for, and which seems to require some explanation. Neither the Thistle butterfly, the Hunter or the Red Admiral were much in evidence during the season here. The *Argynnids* in their various species were moderately plentiful. About the middle of August I received an intimation from Mr. J. D. Evans, of Trenton, that he had taken a specimen of *Papilio Cresphontes* there in fair condition, the furthest east it has yet been reported in Canada. About the same time Dr. Bethune observed one in London ; and on the 25th I picked a damaged specimen off a flower with my fingers, the first of the kind I have seen abroad in several years. It was also reported to me as having been taken in other places in this neighborhood. So that southern butterfly has not yet succeeded in establishing itself as a permanent resident in this locality ; it is even now but a periodical visitor.

Anosia Archippus (Fig. 31) was late in arriving, and remained scarce through the season. The first one I saw was on the 12th of June, in a very worn and faded condition. Then I saw another on the 15th, so bright and fresh that it might have passed for a newly emerged specimen. I received from Mr. Henry Bird, Rye, N.Y., a letter dated 15th May, 1901, in which he

remarked that he had seen an *Archippus* butterfly before that. As scarcely any of the observations published upon the movements of *Archippus* have come from New York State, I take the liberty of giving publicity to the remarks on the subject which he so kindly favored me with, never suspecting that they would go into print. But as they are so interesting in themselves besides assisting in illuminating a page of *Archippus* history, I take pleasure in producing them for the benefit and enjoyment of others.

"My observations, Entomologically, are very meagre so far. One *Archippus* butterfly was noted. This one was sailing along rapidly, a couple of feet from the ground, with an eye open for the first appearance of the milk weed no doubt, and was skimming northward eight or nine

Fig. 31.—The Archippus Butterfly.

miles an hour. It was a worn specimen, and though its progress through the air was much faster, its angling flight searching for milkweed would bring initial progress at about this figure. As I was following in my buggy and had the example in sight some ten minutes I could judge pretty well of its progress.

"But in crossing water much better time is made, of course, and I have made some observations here. I have explained how my home is situated on the shore of Long Island Sound, a long, narrow body of salt water, eight miles wide at this part, and 120 miles long. Long Island, a great sandbank of glacial days, lies the other side of this Sound, and divides it from the Atlantic ocean. Although the warm Gulf Stream swerves off from our coast much further south, still there is some effect on the Long Island fauna, and it affords many features belonging to a more southern latitude. So naturally we may look for southern migrants from that quarter, and this is amply borne out in actual observations. In my younger days, when the "struggle for existence," etc., was not so pressing, I used to find time for a day's fishing now and then, and in a row-boat would anchor a half mile out from the shore on some submerged reef, in about thirty feet of water, and catch the rock-bass in which the Sound abounds. Passing a day in this manner, one has time between bites—both of the bass and of luncheon—to notice what is going on overhead. And one is sure to be struck with the number of butterflies constantly coming from the Island to the main shore. We might expect the supply to be largest on the main land, and that emigration would be going the other way, yet it is invariably as first stated. By far the largest number seen will be *Archippus*, next *Papilios* and *Colias Philodice*. *Archippus* fly at the highest elevation, but begin to drop on nearing shore, so on passing the fishing grounds are sometimes within reach. I have watched them so many times, and their numbers and flight are surprisingly regular. The species seems on the wing continually during the last half of the season, and their flight over the Sound waters seems most methodi-

cal But in this case—they are going north, mind—they fly singly. To a watching fisherman, as an example gets abreast of his boat, he may look out across the water and see another coming in about the same track, and if he strains his eyes a bit, still another, just a speck, can generally be made out, well up in the blue. And so it goes on through the warmer hours of the day. *Archippus* or *Turnus* do not mind the flight at all, but poor little *Philodice* or *P. rapæ* are glad indeed to settle on the first bit of herbage or flower they can reach. So the number which cross this body of water is large, and one rarely sees an example in the water.

"The most striking emigration in point of numbers that I recall as coming from Long Island was that little white and black speckled geometer—*Caterva Catenaria*, which came over in myriads during one whole day, and gave our landscape quite a snow-squally effect. But these feeble flyers were dependent on a stiff breeze for making the trip at all, and then about half of them fell in the water. So much for emigration."

In reference to the point which Mr. Bird has called my attention to: that those separate specimens of *Archippus* were all flying north when crossing Long Island Sound, I would remark, that in doing so at that time they are as certainly obeying their natural inclination to travel, and that for a purpose, as when they go south in crowds later in the season. For, if those single individuals could have been traced to their destination it would have been found that they were making for a general gathering place, where they were forming one of those immense swarms which have attracted so much attention, preparatory to their leaving in a flock to go south together. So the fact of their going north at that time does not conflict with their going south later on, as they have to gather from all directions, at what appears like a preconcerted place of meeting. Constrained by an internal monition, or drawn by some invisible magnetic influence, they gather from every point of the compass to one particular place, as unerringly as the needle turns to the pole, and there await the gathering of the crowd, to start out at the proper time on their long southward journey. As they do not, so it seems that they cannot at that time go singly ; and the belated stragglers that are left behind the migrating flocks in this latitude, assuredly perish.

Numbers of *Archippus* butterflies were to be seen flitting about the streets of London, during the first week of September, and occasionally stopping to feed at moist places. The last one observed on the wing was on the 27th of the month.

About the first of September Mr. Balkwill brought in some beetles that had been found feeding upon green corn inside the husks, with a sample of the injured corn. The beetle proved to be *Euphoria inda*, Linn. (Fig 32), a well-known injurious flower beetle, also bearing an unsavory reputation for spoiling soft ripe fruits, such as pears, plums and peaches. It was the first time my attention had been drawn to its attacking corn in this country, although it is known as an old offender in that direction in the south-western States. From the appearance of the corn that was presented, it is evident that this beetle is quite capable of doing a vast amount of damage in a cornfield where they are numerous ; which, fortunately for Canada, they have not, so far, been found to be. Their ability and method of reaching the corn inside the husks has been a subject of considerable discussion in the localities where their injury has been greatest, some claiming that it is only after the husk has been torn open by bird or beast that the beetles can reach the grain. But from the wonderful strength with which they are endowed, which every one who has handled them must have noticed, one could readily believe that they would have no difficulty whatever in pushing their way inside the husk by the silk end. And, seeing that they bury themselves in the ground to pass the winter, they might easily dig through the husks in order to obtain the succulent morsels within, in the absence of other things within their reach whereon to satisfy their cravings.


Fig 32.

THE PAINTED LADY BUTTERFLY,

(*Pyrameis Cardui*, L).

By James Fletcher, Ottawa.

The irregularity in the appearance of the Painted Lady Butterfly has frequently been noticed by entomologists. For several years the species will be scarce or almost unseen in a locality, then suddenly large numbers will appear, winging their bold and fearless flight in every direction, and will produce what, among collectors, has been called a "Painted Lady year." This insect is one of the very few which are identical with their European representatives, and this one has a very wide distribution, being found, with very slight variations, almost all over the Northern hemisphere. The sudden appearance of a swarm early in the season is due to the migratory habit of this strong-winged fly. There are two broods in the season, as with most of the Vanessians. When I was a boy in England, an annual excursion eagerly looked forward to was a visit made to some caves at Upnor, on the River Medway, a few miles from Rochester. Late in November or December, armed with an unnecessarily large supply of tallow candles and matches, a select party of youthful aurelians used to hie to these caves for the unusual pleasure of catching butterflies in winter. Having reached the caves, we had to enter by crawling over a mound which almost filled the mouth of the cave, when a comparatively large chamber was found with three or four passages running off in different directions. Here the candles were lighted. In small pockets along the passages, hibernating specimens could always be found of the Peacock Butterfly, *Vanessa Io*, and the small Tortoise-shell (*Vanessa urticæ*) of about the same size, and with very similar habits to our Canadian (*V. Milbertii*), to which indeed, unless the two are put side by side and compared, it bears a somewhat close superficial resemblance. Occasionally in these forays, we were lucky enough to find a few Painted Ladies. All the butterflies were hanging from the upper surface of the passages or crevices, with their wings closely shut, and with the antennæ drawn back between the wings. The Peacocks and small Tortoise-shells were easily seen, owing to their dark colour, but the beautiful mottled under-sides of the Painted Ladies made them rather hard to distinguish in the flickering candle light. This butterfly cave was supposed to be a very secret hunting ground, and all who visited it were in honour bound only to take such specimens as were perfect, and only just so many as they actually required.

The Vanessians hibernate in the same way in this country, not only in caves but in hollow trees and in buildings. *Grapta j-album* and *Vanessa Antiopa* I have frequently hibernated artificially in a rather dark unused attic, or in a wooden box behind a fence out of doors. This habit of hibernating in the perfect state is accountable for most of the occasional notices in newspapers of the appearance of butterflies in warm days during the winter.

Last spring the Painted Lady was not uncommon at Ottawa in early June, but was not noticed with *Vanessa Antiopa*, *Grapta j-album* and *Grapta Progne*, sipping maple and birch sap in May. The butterflies came suddenly in June ; all through the month, until the new brood appeared about the middle of July, they were a conspicuous feature of the woodland, along roads, in gardens, and in clover fields. The flight of the Painted Lady is quick and irregular ; it seldom stays long in the same place, flying hap-hazard from flower to flower in a most unbusiness-like manner, always ready for a gambol with another of its kind, dashing close past or circling round and round a new comer. It flies, too, later in the evening than any butterfly I have observed, and at that time of the day seems to delight to settle on buildings. Two or three specimens will sometimes choose the same tower of observation, over and around which they will chase each other apparently with great delight, stopping occasionally in their wild flight, and soaring upwards opposite to each other like two boys, sparring for several seconds at a time. Not only will these intrepid insects dash at other butterflies, but they seem particularly

fond of worrying the large locusts—*Dissosteira Carolina* and the clicking *Circotettix verruculatus*—when these are flying by or are hovering in the air over their mates. These clumsy flyers, surprised and indignant at the unexpected onslaught, make a few spasmodic efforts to evade their nimble persecutors, but soon settle down with rustling wings to the ground.

The Painted Lady seems particularly to enjoy flying round and round the tops of mountains. Collecting on the bare black summits of mountains, where there is little cover, is always a matter of some difficulty, but this is much increased by these frolicsome, restless, fickle, "ladies." After carefully stalking, perhaps creeping on all fours, over hot rough rocks, towards a much desired Argynnis, or Chionobas, which, although very much on the alert, has at last settled for a few moments, how often are the collector's hopes dashed to the ground by seeing one of these restless sentinels rush in and stir up his quarry, driving it off over the edge of the mountain, not to return again for a long time. This, however, is far from being the case with the unwelcome tormentor, which is back again within a few moments, sunning its wings within a few feet of him, but just beyond the reach of vengeance, and ready for the next effort. *Vanessa Californica*, a cousin of the Painted Lady, was not uncommon during the past summer in the Rocky Mountains and was also found to have the same, in the eyes of the collector, most objectionable habit.

In Dr. Scudder's splendid work, the "Butterflies of the Eastern United States and Canada," a most interesting account is given of the Painted Lady and its habits. Quoting from Meyer-Dur, he says, "Its wildly timorous behaviour is quite striking; it is uncommonly audacious; swift and savage it dashes irregularly about, scarcely observing the pursuer; heedless of the net it returns directly to the place it has left, and sits with horizontally opened wings on the dry earth or spots of sand. It is a nimble, lively, youthful, untamed, petulant insect which shows in its behaviour no resemblance to its proud but circumspect neighbour *Atalanta*."

Dr. Scudder says himself of this butterfly: "It frequently alights on stone walls heated by the sun, and is greatly attracted by flowers, particularly by thistles and the other plants upon which the caterpillar feeds; here it may readily be taken; not so in other spots, for although very fearless, and even impudent, it is exceedingly wary, dashing off headlong at the slightest alarm."

In 1884 a remarkable occurrence of the Painted Lady Butterfly was noted, and the fact was recorded by Dr. Saunders in his presidential address to the Society (Can. Ent., xvi., p. 211) that it was so numerous in Manitoba as to have been the cause of some alarm to farmers, who feared that the caterpillars might attack some of the growing crops. A similar invasion occurred last summer (1901) in North America and caused at first much anxiety to farmers in the West. The species was noted at Ottawa, and the insect was extremely abundant at Nepigon and from that point westward to the Pacific. Newly emerged specimens were taken at Nepigon on the 1st July. Manitoba seems to have been the centre of greatest abundance in Canada. Mr. A. J. Dennis, of Beulah, Manitoba, writes on the 10th June: "*Pyrameis Cardui* is as a rule an uncommon species here. I have never taken more than one or two specimens in a season, but this year they are in countless numbers. They simply cover the prairies and have been flying in all directions for the last six weeks." A few letters were received from farmers anxiously enquiring whether the caterpillars which were abundant on summer-fallows, were likely to attack crops after they had finished the weeds. They were informed that this was not in the least likely. Mr. Donald Macfarlane of Oak Lake, Manitoba, writing on the 25th June, says: "These caterpillars first appeared in this district during a spell of dry weather about two weeks ago. They were first seen on thistles and other weeds which they rapidly devoured, and are now spreading over many other plants; even the roadways are strewn with myriads of these insects, all seeming to be in sympathy with the Government's immigration policy and moving westward." In travelling through Manitoba early in July I saw large numbers of the caterpillars feeding upon the Canada Thistle, but particularly upon the Borraginaceous weed, Blue Bur

(*Echinospermum Lappula*). This was a new food plant for the species, and it is rather remarkable that it should have been so conspicuously the favourite food plant in the West. The Blue Bur is not indigenous on the prairies but has spread rapidly as an agricultural weed in Manitoba and the North-West Territories during the past year or two. Upon some fields which had been left for summer-fallowing large patches of this weed could be found stripped bare of every leaf by the caterpillars of the Painted Lady. Other plants noticed in different places, which were eaten by this caterpillar, were the Western Mugwort (*Artemisia Ludoviciana*) and the Pearly Everlasting (*Anaphalis Margaritacea*). In a few instances, caterpillars were seen upon the small Round-leaved Mallow, and were reported on holyhock and burdock. At Kaslo, B.C., I was surprised to find the larvæ feeding (30th July) on the prickly Borraginaceous plant, *Amsinckia intermedia*.

It is probable that our Canadian swarm may have come from the south and west. Mr. J. W. Cockle, of Kaslo, on Kootenay Lake, B. C., an energetic and very observant entomologist, wrote me last spring that on May 2nd a swarm of this butterfly had passed Kaslo. He says: "They were here on that date in thousands, but most of them only stayed a day or two; from which I suppose they have migrated to some other point." At the same time Mr. Cockle sent me the following interesting extract from the Spokane Review of May 26th:

MIGRATION OF BUTTERFLIES.

Spokane Review, May 26.

COUNTLESS THOUSANDS OF THEM FLYING OVER SOUTHERN CALIFORNIA.

"For weeks a remarkable migration has been taking place in southern California, and is still in progress. The migrant is a brown butterfly, known as Pyrameis cardui.

"At first the butterflies were noticed in twos and threes, then in dozens, then in countless thousands, all flying in one direction, to the northeast and parallel to the Sierra Madre range, Some idea of the numbers can be conceived when it is said that in looking across a lawn 90x40 feet four or five butterflies were continually crossing the line of vision, and this was true, so far as could be learned, of every lot in the vicinity.

"The insects move with a regular rate of speed, always in the same direction; now in pairs, again singly or in groups of 10 to 12. Such specimens examined show that they had travelled a long distance, and it is thought by some that the migration began in Mexico, hundreds of miles away.

"In attempting to guess at the cause, it may be assumed that it has been a favorable year for this butterfly in some region to the south, and that the countless caterpillars have changed into butterflies in such swarms that to obtain food they have begun this migration, the direction of which has been governed to some extent by the mountain range."

It may be the case that after this year *P. Cardui* will be less abundant than usual for some years, in accordance with the rule which seems to govern the occurrence of insects in general, namely, that an excessive abundance of a species generally foretells an unusual scarcity the next or the following year. Any remarkable observation concerning insects should always set the careful observer thinking, so that, if possible, the cause for the unusual occurrence may be discovered.

At the end of Dr. Scudder's article he gives the following under the head of *Desiderata*: "Cardui is one of the best subjects of study for those who wish to investigate the causes of irregular apparition; and only those who spend much time in the field can hope to solve the problem. A close observation of the comparative abundance of the butterfly for several consecutive years in the same locality, accompanied by the attempt to rear hundreds of the caterpillars, selecting only those which are very nearly full grown, and recording the proportion of healthy and infested ones, will probably show whether the attack of parasites is a *vera causa*.

The above is submitted to our members to remind them that there is still good work to be done even with this showy and not uncommon species. Should the insect appear again next year in any abundance, efforts should be made to carry out Dr. Scudder's suggestion with a view to solving the points raised. Exact dates of the first appearance of the butterflies and notes as to the times of greatest abundance should be carefully kept, and, if these facts are recorded by several observers at different points, they would certainly furnish much valuable information towards solving this problem.

THE NORTH AMERICAN FALL WEBWORMS.

By Henry H. Lyman, M.A., Montreal.

The name Fall Webworm, as is well known, was given by Harris to the caterpillar of the moth which he described under the name *Arctia Textor*, but for which he subsequently erected the genus *Hyphantria*, putting also in it the Many-Spotted Ermine Moth of the South, originally described under the name *Bombyx Cunea* by Drury. As I have already given in the "Canadian Entomologist" * a somewhat extended historical sketch of these moths, it is not necessary to repeat it here.

The earliest published opinion that *Cunea* Drury and *Textor* Harris were not specifically distinct, which I have been able to find, was that contained in the short paper by Mr. Graef in Bull. Brooklyn Ent. Soc., III. 14, 1880, he having taken all intergrades between immaculate and heavily spotted, and having seen the two forms in copulation, as had also Mr. Otto Meske of Albany. In the August number of the same journal, Mr. G. H. French recorded having bred both forms from a nest of caterpillars which had apparently just hatched from a single cluster of eggs deposited by a single moth. In the same year, Riley in the General Index to his Missouri Reports also placed *Textor* as a synonym of *Cunea*, but in Grote's Check List of 1882, *Textor* and *Punctata* stand, apparently, as good species, though without numbers, *Punctatissima* A. & S. being the only name given as a synonym of *Cunea* Drury.

In 1887 Riley issued Bulletin No. 10, U.S. Division of Entomology, on "Shade Trees and their Insect Defoliators," in which, writing of the Fall Webworm, he said, "The moths vary greatly, both in size and coloration. They have, in consequence of such variation, received many names, such as *cunea* Drury, *textor* Harr. *punctata* Fitch, *punctatissima* Smith. But there is no doubt, as proven from frequent breeding of specimens, that all these names apply to the very same insect, or at most to slight varieties, and that Drury's name *cunea*, having priority, must be used for the species."

Since that date, it seems to have been generally accepted that we had only one species varying greatly, and even *Congrua* Walker was supposed on Mr. Butler's authority to be merely a variety of *Cunea*. Having no evidence to urge against this conclusion, and having no acquaintance with the Many-Spotted Ermine Moth in life, and only a pair in my collection, I, as so many others continually do, accepted perfunctorily the dictum of these authorities, though living in the *Textor* region where *Cunea* does not occur, I could never really bring myself to believe that the two forms belonged to one species, and thus the controversy which started in the May 1899 number of the "Canadian Entomologist" over the question as to what species was the true *Cunea* of Drury quickened my interest in the Fall Webworm moths, and I determined to solve the problem if possible. I therefore appealed to Dr. Harrison G. Dyar to secure for me eggs of *Cunea*, and this he kindly did, instructing his assistant to get them for me.

On 3rd August I received from Washington a batch of eggs mailed on 31st July, accompanied by the moth which laid them, and which was still alive and still ovipositing.

* Vol. XXXII. 122.

The eggs were deposited on the underside of a leaf, and were described as follows :

Diam. ½ mm., finely pitted, of a pale delicate green, the batch covered with white down from the abdomen of the ♀ but those laid after the moth reached me had very little of the down about them.

Riley described the eggs as being of a bright golden-yellow colour, having, on account of the pitted surface, the appearance under a magnifying lens of a beautiful golden thimble, but this is erroneous, as I have had and examined many clusters of these eggs, and all were of a pale, delicate green. Occasionally a few yellow eggs will be found in an egg cluster, but these appear to be bad ones, as I have never known them to hatch. The parent of this first brood, which I called No. 1, was a little rubbed, but so far as I could see was immaculate. It is shown on the plate as fig 1. (See frontispiece plate).

The larvæ hatched on 11th-13th August, giving an egg period of about 12 days in the latitude of Montreal.

These larvæ were carried by me to Rockland and Portland, Me., and back to Montreal, through the White Mountains, and were thus never out of the *Textor* region. They were fed on American Elm. For comparison, I also secured a part of a batch of *Textor* larvæ from a nest on a birch tree in Mount Royal Park, but having been entrusted to a friend while I was at the seaside they were, on account of their commonness, somewhat neglected, and only about half a dozen survived. When the larvæ of both forms were mature, I immediately saw that they differed strikingly from each other. The larvæ of *Cunea* vary considerably among themselves, but only within the limits of what may be called the *Cunea* form, never to my knowledge, and I have bred not far short of a thousand of them in various broods, varying in the direction of *Textor*.

The distinction between these larvæ may be broadly stated as follows :

Cunea has the lateral broad band, light in color, not much sprinkled, and the warts on it yellowish, the upper row occasionally tinged with orange, and the hairs chiefly blackish gray. *Textor* has the lateral band heavily sprinkled with black dots, giving it a bluish appearance, the warts upon it orange-red, and the hairs chiefly foxy red-brown.

These larvæ thus differ much more than the larvæ of many allied species whose distinctness is never called in question. Probably owing to the latitude in which they were raised this first brood matured slowly, and as the season advanced it was difficult to secure any green elm leaves, and to keep them fresh for any length of time. Some of this brood seemed to be affected by some intestinal trouble, the pellets of frass remaining held to the anus by a reddish filament. One was observed to have no less than four such pellets in a chain attached to the anus. When elm was no longer to be had I changed the food to apple, and was able to secure this in a green state even after the first frosts.

Those larvæ which spun up among the leaves were placed in a box with a zinc pan in the bottom, covered with a layer of crushed quartzite kept moist, the box being covered by a pane of glass, but those which spun up attached to the floor and sides of the breeding cage were not disturbed.

The specimens kept in the damp box began emerging on 18th March, 1900, and continued to do so up till the 12th April, when I left on an Easter trip to New York, Philadelphia, and Washington. Up to that date none had emerged in the breeding cage, and I feared that they must have become dried up, but on my return home on the 21st, I found that a number had emerged, and they continued emerging up to the 16th May, being thus just one month later than those kept in a moist atmosphere.

About seventy five specimens in all were reared, though some were crippled or otherwise damaged and not worth preserving, and of these only four females were absolutely immaculate, that is, about 5 per cent. of the whole brood, or about 10 per cent. of the females. Many of the latter sex were quite heavily marked, more so than the average male of ordinary broods,

and the statement of Smith & Abbot, "the female being entirely white," is thus seen to be incorrect, though in the majority of cases it is true, and in the other broods raised by me, spotted females were of extreme rarity, not occurring at all in summer broods and very rarely in spring broods. Figures 2-11 are of this brood, showing the variation from heavily spotted to immaculate.

Had I been contented with the results attained in rearing this most remarkable brood I would have maintained that such a thing as an immaculate male *Cunea* did not exist, and should thus have been quite as far astray in my conclusions as the many authorities who have written of these forms.

But in order to see what difference, if any, existed between the spring and summer moths, I appealed again to Dr. Dyar to supply me with a batch of eggs along with the parent moth. This he was unable to do, as he did not secure any of the female moths, but he sent me two broods of young larvæ whose depredations upon sycamore trees had just begun to attract his attention.

These broods I named A and B, and as it was too much trouble, especially for the friend with whom I left them when I sailed for England in June, to go up the mountain to my sycamore tree for fodder, the food was changed, and brood A was reared on elm and brood B on apple.

On my sudden return from England on 8th July I took over the care of these broods and carried them on to imago, but to my surprise very few of brood A emerged, though the moths from brood B emerged very freely. The dates of emergence ranged in brood A from 27th July to 19th August, and in brood B from 27th July to 13th August. The moths from these broods were hardly at all spotted, a few only of the males being lightly marked, while many males and all the females were absolutely immaculate, and so indistinguishable in the imago state from *H. Textor*, but the larvæ had been of the *Cunea* form, though not quite so dark as the fall brood of larvæ reared in 1899. These moths are shown Nos. 13-16 summer brood A, Nos. 24-27 summer brood B.

From a mating between A and B I secured another batch of eggs, which in due time hatched and produced brood AB.

As Dr. Dyar had also been rearing a number of broods of *Cunea* at Washington I suggested dividing broods, each sending the other a half of one of the broods, in order that we might see what difference, if any, would result from difference of latitude.

I sent a share of brood AB to Washington and received in exchange a portion of one of the Washington broods resulting from a mating of moths of the summer brood. No distinguishing number was sent with this brood, and I merely marked it "½ Dyar's brood." Unfortunately Dr. Dyar's assistant omitted to make a note as to which brood he divided with me, and I am therefore unable to compare my results with those obtained at Washington.

The moths of this brood from Dr. Dyar emerged from 28th April to 10th May, 1901, and were almost immaculate, only a very few of the males having a few dots, Nos. 29-33 showing the range of variation.

The result of this brood proves that a spring brood may be quite as lightly marked as the most lightly marked summer brood, and it is probable that the influence of the parents is a potent factor in determining the result, but that, other things being equal, a spring brood will be more heavily marked than a summer one, was demonstrated in the most remarkable manner in brood A.

I have already mentioned that very few of this brood emerged in July and August, 1900, the great bulk of the brood going over the winter, thus showing the tendency of the double brooded *Cunea* of the South to become a single brooded moth in the latitude of Montreal.

The contrast in this brood between the summer emerging moths and those which passed the winter in the pupal state was most marked, as many of the males were heavily spotted, though

some of the males and nearly all the females were immaculate, only one or two of the females being lightly spotted, Nos. 17-22 showing the range of variation in the spring part of brood A.

As already mentioned, nearly all of brood B had emerged in July and August, 1900, but three or four emerged in the spring of 1901, and No. 28 is a male of that brood which went over winter, showing the same tendency to heavy marking in the spring brood, and this fact has a very strong bearing upon the question of the specific distinctness of these two forms, for if both belonged to one species, *Textor* having only a spring brood in this region, should be a spotted form instead of being an immaculate one.

In the summer of 1900, I also secured part of a brood of *H. Textor* larvæ on Montreal Mountain, and sent a portion to Dr. Dyar, but he did not succeed in getting any through. I was successful with those I retained, but, curiously enough, a few emerged in the autumn, but those which emerged in the spring came out a little later than the *Cuneas* of brood A.

The latter emerged between the 5th and 15th May, with one belated one on the 20th, and another on 26th, while the *Textors* did not begin to appear till the 19th May, and came out between that date and 2nd June. Dr. Dyar succeeded with the portion of brood AB which I sent him, but, unfortunately, I did not with the ones I retained. They, were I fear, confined too long in a glass jar, and so became unhealthy before being transferred to a cage, and died off shortly after I left on my second trip to England, so here again we were unable to compare results.

A very important point which I brought out in my experiments was the refusal of *Cunea* and *Textor* to mate. At least three times was the experiment tried, when conditions were favourable, both moths being freshly emerged, but always with the same result, although they were left together for days. That no mating took place, I am positive, as close watch was kept at frequent intervals, and in a mating of *Cunea* which was timed, copulation continued from about 11 p. m. till about 8 p. m. the following evening. The *Cuneas*, however, mated all too readily among themselves.

To sum up the results of my experiments extending from the summer of 1899 to the spring of 1901, I find :

1st. That *Hyphantria Cunea* varies in both sexes from heavily spotted to absolutely immaculate.

2nd. That *Hyphantria Textor* is invariably immaculate.

3rd. That the two forms differ markedly and constantly in the larval state, while *Cunea* especially varies within its own range.

4th. That the two forms will not mate.

5th. That, other things being equal, the spring brood of *Cunea* is more heavily marked than the summer brood.

6th. That in the north *Cunea* tends to become a single brooded, heavily marked form.

I therefore contend that my results prove beyond reasonable doubt that we have two valid species, though in the imago stage it is impossible to distinguish between an immaculate *Cunea* and a *Textor*, and that the name given by Harris should therefore be restored to full specific rank.

Now, as to the synonymy, in Neumoegen & Dyar's "Preliminary Revision,"* the name Var. *Budea* Hübner was used for *Textor*, but this reference was evidently founded on a misapprehension as Hübner's figure shows a moth with a single dot on each fore wing, exactly as in fig. 14 of my plate, and the description mentions this spot, as I am now informed by Dr. Dyar.

*Journal N. Y. Ent. Soc. I. 178.

The species should therefore stand as follows :

HYPHANTRIA. Harris.

CUNEA, Drury. (*Bombyx*).

Punctatissima, Abbot & Smith. (*Phalæna*).

Budea, Hübner. (*Cycnia*).

Mutans, Walker. (*Spilosoma*).

Punctata, Fitch. (*Hyphantria*).

Ab. var. Pallida, Packard. (*Arctia*).

TEXTOR, Harris. (*Arctia*).

? *Candida*, Walker. (*Spilosoma*).

I have referred *Candida* Walker doubtfully as a synonym of *Textor*, as it is impossible to be sure that the type was not merely an immaculate *Cunea*, unless it could be shown to have come from a locality where *Textor* occurs and *Cunea* does not.

Figure 12 on the plate is shown as agreeing with almost absolute exactness with Drury's figure of *Cunea*, and Figure 23 as the nearest specimen to the very aberrant type of *Arctia Pallida* Pack. which I have been able to obtain. Sir George Hampson, in Vol. III of his work on the moths of the world, refers to Hyphantria the species described by Grote as *Alexicles Aspersa*, but as he admits the species is unknown to him, I consider the reference at least doubtful.

In the following summary I have endeavored to classify the individuals of the different broods, but any such classification is artificial, and merely approximate, as they merge by the slightest possible gradations from one extreme to the other.

SUMMARY.

Brood.	No. 1.	A.		B.		Dyar's.
Emerged.	Spring.	Summer.	Spring.	Summer.	Spring.	Spring.
Heavily Spotted						
♂	7	....	5	....	....	....
♀	3	....	....	....	....	....
Well Spotted						
♂	14	....	14	....	1	....
♀	13	....	....	....	....	....
Lightly Spotted						
♂	2	....	21	3	....	....
♀	9	....	1	....	....	....
Traces of Spots						
♂	0	5	9	9	....	10
♀	7	0	6	....	....	....
Immaculate						
♂	0	6	12	21	....	14
♀	4	6	45	17	2	22

Before concluding, I desire to acknowledge the kindness of Dr. Dyar, not only in supplying me with the necessary eggs and larvæ of *Cunea*, but also in carrying on similar experiments at Washington, breeding over 600 moths, the results of which I am permitted to give in the annexed Appendix, and which tend to confirm my conclusions.

I may also say that I learned through Dr. Dyar that Mr. Theodore Pergande had, from his own observations, become convinced that there were two species, the one varying from spotted to white, and the other always white, but differing in the larval state, just as my experiments have shown that they do.

To be the means of proving the correctness of a name given by Dr. Harris, for whom I have such a profound respect, is a source of gratification.

Explanation of Plate.—(See frontispiece).

No. 1. ♀ parent of brood No. 1.

No. 2-6. ♂ ♂ brood No. 1 emerged March-May, 1900.

No. 7-11. ♀ ♀ brood No. 1. emerged March-April, 1900.

No. 12. ♂ from N. J. as close as possible to Drury's figure.

No. 13-15. ♂ ♂ brood A. emerged July-August, 1900.

No. 16. ♀ " " " "

No. 17-20. ♂ ♂ " " May, 1901,

No. 21-22. ♀ ♀ " " " "

No. 23. ♂ similar to Packard's *Arctia Pallida*.

No. 24-26. ♂ ♂ brood B emerged end July, 1900.

No. 27. ♀ " " 5th August 1900.

No. 28. ♂ " " May 1901.

No. 29-31. ♂ ♂ Dyar's brood emerged May, 1901.

No. 32-33. ♀ ♀ " " emerged May, 1901.

APPENDIX.

Results obtained at Washington, by Dr. H. G. Dyar in carrying on parallel experiments 1900-1901.

Summer Moths.

Brood

D 1* Eggs on sycamore, Washington, D. C., June 1, 1900. No moths.

D 2* On pear, Hollydale, Pa., May 24th, 1900. Bred at Washington, D. C., 23 moths (13 ♂ 10 ♀) white, 4 ♂ with traces of spots.

D 3* On Sycamore, Washington, D. C., June 1, 1900. 36 moths in July-August (19 ♂ 17 ♀) white, 3 ♂ slightly, 1 ♂ distinctly spotted.

D 4* On Sycamore, Washington, D. C., in stage II, May 29, 1900. Moths in August, 90 moths (43 ♂ 47 ♀) white, 3 ♂ with traces of spots.

D 5* On Sycamore, Washington, D.C., June 1, 1900. Moths in August, 4 moths (1 ♂ 3 ♀) white.

D 6* On Sycamore, Washington, D. C., June 1, 1900. Moths in August, 145 moths (77 ♂ 68 ♀) white, 3 ♂ with traces of spots.

D 7* Eggs from ♀ on Sycamore, Washington, D. C., hatched June 11, other broods in stages III and IV at the time. Moths in August, 204 moths (103 ♂ 101 ♀) white. 6 ♂ with faint grayish spots.

D 8* On Mulberry, Montreal, Ga., (J, H. Heard), June 8, 1900. Moths in August, 7 ♀ white.

Spring Moths.

D 9* Mating of moths of D 4 end of July, 1900, Moth 1 ♀ white April 24th 1901.

D 10* Mating of moths of D 7 August, 1900. Moths March 24–May 2, 1901, 28 moths (11 ♂ 17 ♀) ♂ all lightly spotted, ♀ all white.

D 11 Brood of H, Textor from H. H. L., Montreal, no moths.

D 12* Anothing mating of D 4 end of July, 1900, Moths March 28–May 4, 1901, 20 moths (5 ♂ 15 ♀) most of them spotted, none heavily, but 1 ♂ 5 ♀ white.

D 13* A mating of Mr. Lyman's broods A and B sent from Washington 30th May, 1900, and the larvæ of brood AB returned to Washington. Moths March 24–May 1, 1901, 46 moths (42 ♂ 4 ♀) Spotted, some heavily, 3 ♂ and 3 ♀ white.

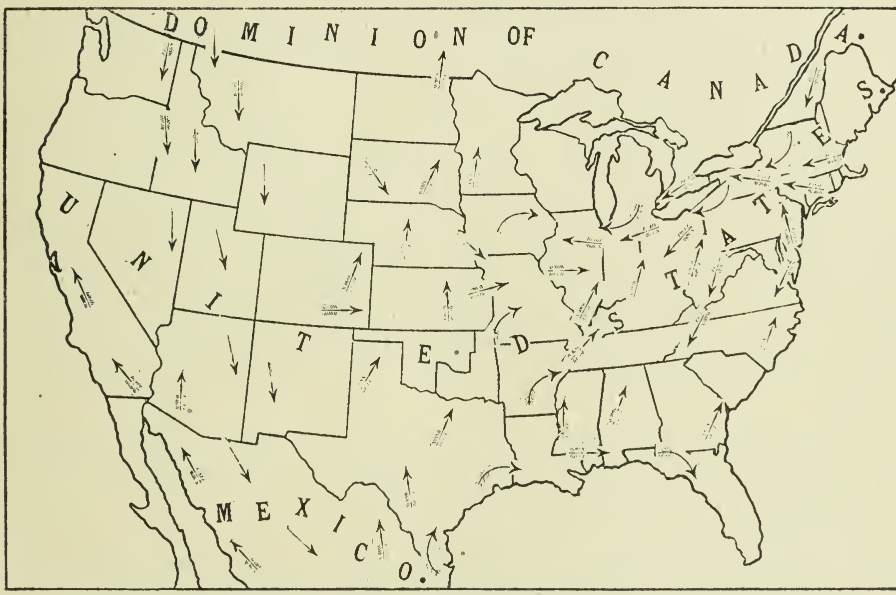
*Larvæ of *Cunea* type.

THE TREND OF INSECT DIFFUSION IN NORTH AMERICA.

By F. M. Webster, Wooster, O.

American entomologists have for many years been engaged in observing, defining and recording the distribution of species of insects and their progress, if of a migratory nature. In earlier days, when entomologists were few in number and widely scattered, there was little opportunity for serial observations or combined studies. But now, with entomologists in every State, the distribution of species can be more thoroughly studied and their movements, if such occur, carefully traced across State after State with surprising promptness and accuracy.

While it is not the object of this paper to gather up all the facts bearing on this subject that are scattered through our literature, it does seem proper, at this time, to sketch, tentatively at least the possible if not probable paths along which some insects, once unknown, but now common, have made their way to their present areas of habitation.



Map 1.—The Trend of Insect Diffusion in North America.—Webster.

Acquisitions to our insect fauna have come to us, almost exclusively from two sources, viz., either by introduction amongst articles of commerce or through natural influences, in the latter cases coming either from the north or the south, generally the latter.

The Appalachian mountain system on the east and the Cordilleran mountain system on the west, while they do not prevent the introduction of foreign insects along our sea coasts, they do present more or less impassable barriers to the direct progress of such insects inland. In the case of the Cordilleras these appear to separate the northward flowing stream of tropical and sub tropical species in its onward course, sending one portion along the Pacific coast and the other along the coast of the Gulf of Mexico, the latter sometimes spreading broadly inland, while the former holds more closely to the coast. The influence of the high plateau in Mexico on the eastern branch of this insect stream, will, some day, offer material for a most interesting study, even if it does not solve the problem of the evolution of several of our common insects. The Appalachian system does not approach the gulf coast at its southern terminus, but leaves a broad avenue that enables species moving eastward to pass on along the gulf to the Atlantic coast and thence northward. It does, however, to the northward form an almost impassable

obstruction to the directly westward migration of insects from east to west, broken only in the State of New York and the country adjacent to the north and south shores of Lake Erie. Here we have a huge gateway through which nearly or quite all species imported from Europe, landing on our eastern seacoast, north of the mouth of the Potomac river at least, make their way into the comparatively level country beyond. It is barely possible that the valley of the Big Kanawka river in West Virginia and Cumberland Gap may offer passage ways for an occasional species, but of this we have no proof as yet. In the Cordilleran system there do not appear to be any such openings or gaps for the outflowing and spread of migrating species, except, perhaps, in extreme southern California and Arizona, a country so arid that few species can take advantage thereof, if it really exists, hence, a separation in South or Central America usually remains permanent, while in the case of the Appalachians, a species may work its way south along the Atlantic coast to the Gulf, and in a comparatively short time mingle with the northern branch that has made its way west to the great lakes and thence southward.

Besides these, there are paths of migration from the north southward, but these are confined to the two mountain systems now under discussion.

I will now take up each of these paths or trails of migration and give a few illustrations to make my points more intelligible. (See Map 1.)

The imported cabbage butterfly, *Pieris rapæ*, as is well known, was first observed in the vicinity of Quebec in 1860. From here it gradually spread south into New England and west through New York, so that it actually invaded Canada from the United States in 1872, and a year later, *in the spring of 1873*, it appeared at Cleveland, Ohio, in limited numbers.[1]

Many years ago one of the Dung beetles, *Aphodius fossor* L., which occurs in Europe, was introduced into the same section of country as the preceding, and like it spread southward into New England, and is now only being found occasionally in northeastern Ohio, though it was included in the list of Lake Superior species in 1878 by Hubbard and Schwarz, but not in the 1880 list of Reinecke and Zesch of species found within 15 miles of Buffalo, New York. In this case it evidently spread faster through Canada, but came to Ohio by the way of western New York.

The Asparagus beetle, *Crioceris asparagi*, introduced from Europe many years ago, first appeared in Ohio in the northeastern portion of the state, precisely as it made its way into Canada by way of western New York. *Crioceris 12-punctatus* has not yet been found in the State of Ohio but is to be expected within a year or two.

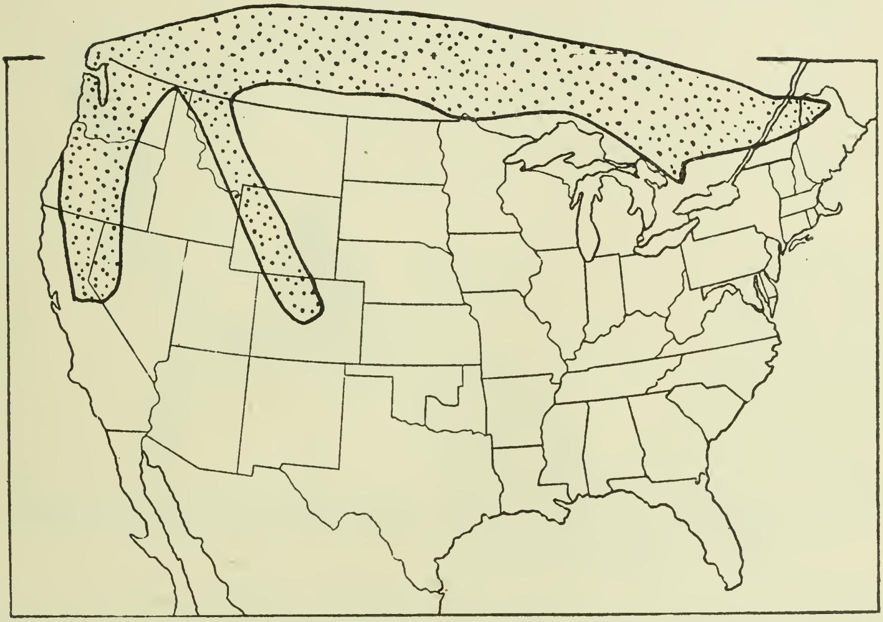
The clover leaf weevil, *Phytonomus punctatus*, and the clover root borer, *Hylastes obscurus*, both imported from Europe and both first coming to notice in western central New York, were first reported in Ohio in the northeastern counties. It is true that a single specimen of the former was taken from the *crop of a crow shot in Michigan in 1892.*[2] Yet had it invaded the State of Ohio from that direction the fact would have been shown by its presence in the clover fields of the farmer. I found it abundantly at Chautauqua Lake, New York, in August, 1888, and it must have entered Ohio a year, or at most two, afterwards. It is true that Mr. Dury found it near Cincinnati in 1892 and Mr. Hine in Lucas County the following year, but it did not become noticeably abundant until long after the farmers in northeastern Ohio were complaining of its attacking clover. The *Hylastes* also was found about Cincinnati soon after its appearance in northeastern Ohio, but like the *Phytonomus* it was probably carried into some of the tributaries of the Ohio river, possibly in northeastern Ohio, during the high waters of spring and down stream, being left by the receding water with driftwood and other debris, far back among the cultivated lands along the river itself.

[1]Scudder The introduction and spread of *Pieris rapæ* in North America, 1860-1885. Mem. Bos. Soc. Nat. Hist. Vol. IV., No. III.

[2]*The Common Crow of the U.S., Burrows and Schwarz* : Bull. 6, U. S. Dep. Agr. Div. Ornithology and Mammology.

Even the Horn Fly, *Hæmatobia serrata*, was first reported in the State at a point some thirty miles east of Cleveland, though it appeared elsewhere soon after, and now we have another illustration in the Willow and Poplar Curculio, *Cryptorhynchus lapathi*, found at Ashtabula in the extreme northeastern county within a few weeks. This last appeared about Buffalo, New York, in 1896.

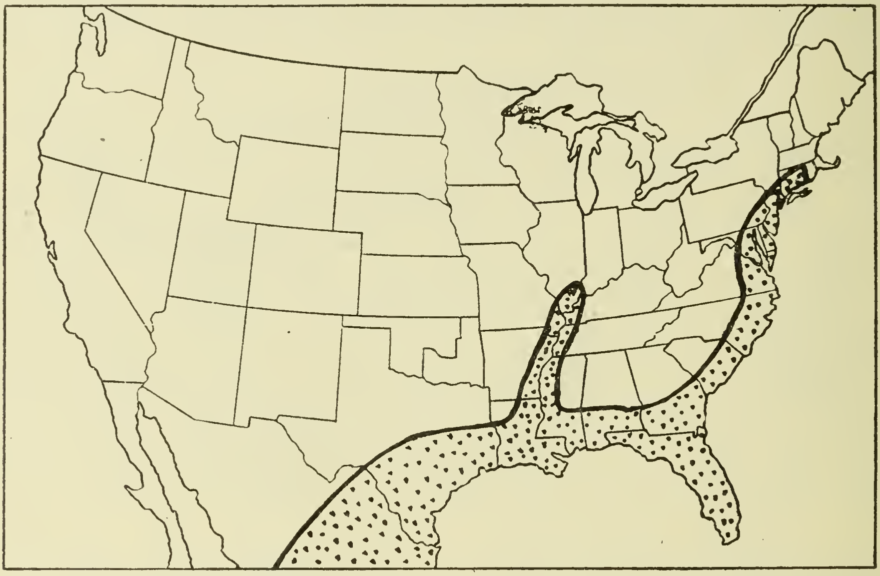
The foregoing illustrations will, I think, show clearly that there is a gateway opening into Canada between the east end of Lake Erie and the western end of Lake Ontario as wide as the Niagara River is long, through which insects introduced from Europe make their way, frequently even when such have been first introduced into Quebec, seemingly preferring to make their way westward to the south of Lake Ontario instead of to the north of it. The gateway on the United States side is along the south shore of Lake Erie, and between it and the northern terminus of the Alleghany mountains.



MAP 2.—The dotted area shows territory over which *Erynnis Manitoba*, the Canadian Skipper Butterfly, occurs and illustrates the southern trend of northern species. (Adapted from Scudder.)

The eastward trend of insect migration is followed, either by species whose native habitat is along the foothills of the Rocky Mountains, or else by such as have come up from the far south and swayed broadly to the eastward across northern Missouri, Iowa and possibly southern Minnesota. The spread of the Colorado Potato beetle, *Doryphora 10-lineata*, is a good illustration, while the Box Alder bug, *Leptocoris trivittatus*, which is slowly but surely making its way eastward, having, as Dr. Forbes informs me, reached eastern Illinois, is another example. Of those that have come up from the far south and fallen into this trend of migration, probably *Diabrotica longicornis* will offer the best illustration, and this will lead me to the discussion of the northward spread of tropical and sub-tropical species. This species was first observed along the eastern slope of the Rocky Mountains, and up to within the last thirty-five years was a comparatively rare insect, found in summer on the blossoms of golden-rod and thistles, and probably occurred, locally, far to the eastward, possibly reaching the Atlantic coast within the last twenty-five years. The writer can well remember when it was of uncommon occurrence in northern Illinois, where now it literally swarms, under certain conditions of Indian corn

culture, to which crop it has come to be a veritable pest. Somewhere in the great corn fields of Illinois and perhaps Iowa, this insect acquired the habit of breeding in the roots of corn, and what seems to be a corn feeding race has sprung up and has slowly made its way eastward, having now reached the eastern half of Ohio. As illustrating this feature of its diffusion, while I have been closely watching its progress in western Ohio, I was unable for ten years to find a single individual about Wooster, situated about 65 miles from the eastern line of the State, and about 35 miles from Lake Erie. In the summer of 1900, however, I found a single individual in my garden on the common sunflower, and, judging from past experience in other States as well as in western Ohio, we shall soon have the insect in abundance. Elsewhere* I have discussed



MAP 3.—The dotted area shows the territory over which *Lerema accius*, the Clouded Skipper Butterfly, occurs. This is the area covered by the northern trend of southern species. (Adapted from Scudder.)

the diffusion of the genus at considerable length, and it is unnecessary to repeat here what was there stated, except to again call attention to the fact that our *D. vittata* has a very close relative in *D. trivittata* on the Pacific coast and that our *D. 12-punctata* has an equally near relative in the *D. soror*, also of the Pacific coast, while each has an intermediate species that seems to connect the two in each case. This phenomenon I attribute to the fact that the original stem species may have become separated far to the south, and one branch followed the western slope and the other the eastern, Prof. Cockerell's *D. vittata* var., *incerta* coming between the former and *D. trivittata*, would seem to give us an illustration of an intermediate species in the process of evolution, while in *D. tricincta*, which occupies a similar relation to *D. 12-punctata* and *D. soror*, the evolution has advanced further and we have what we term a good species. From some more recent studies of *Myochrous denticollis* and allied species of that genus, it would seem that something similar might have taken place with reference to that species as well†.

The southern terminus of the Appalachian system has a similar effect in dividing the streams of insect migration, after such have passed to the eastward along the gulf coast, one branch keeping along the Atlantic coast and the other to the west of the mountains, but without any such influences on the species as seemingly occurs in Central America and Mexico. Thus, there

*Jour. N. Y. Ent. Soc., Vol. III, pp. 158-166 ; Vol. IV, p. 67.

†Loc. Cit., Vol. IX, p. 127.

is no perceivable difference between the *Dynastes tityus* that breeds in the southern portions of Illinois, Indiana and Ohio, and those found some distance up the Hudson River in New York. The same is also true of the Bag Worm, *Thyridopteryx ephemeræformis*, which along the sea coast extends northward to Massachusetts, and in the west it has been sent me from within twenty-five miles of Lake Erie, though it is but fair to say that this was in case of a single sack, the species not occuring abundantly north of Columbus, in this State, and, until quite recently, it was not to be found even that far north, yet there is no apparent difference between Ohio and Massachusetts specimens, so far as I have been able to learn. The chinch bug, *Blissus leucopterus*, may, perhaps seem to offer an exception in its abbreviated wings along the shores of the Atlantic, but as we have the same phenomenon in the same species on the Pacific coast, it would seem that it is due to maritime influences. If one will take almost any study of the distribution of our species of insects and examine it closely, he will be surprised at the number that extend their habitat south into Central and South America, and will get the impression that many of our species really extend from the tropical countries northward, instead of from north to south, as it is usually given by our systematists. A good illustration is afforded by a recent "Review of the Tettigonidæ of north America, north of Mexico," by Mr. Elmer D. Ball, who, after the common usage, gives the species as occuring from its northernmost known home south when in the cases of 19 out of 26 species considered, this statement should have been reversed. These illustrations only convey a limited idea of the wealth of material awaiting the student of the origin of our insect fauna.

There remains only one more tide of insect migration to consider and *that from the north* to the southward. Mr. Schwarz* has given two exceedingly good illustrations of this, one, *Aphodius rufipes*, which occurs all over Europe and Siberia, but in North America only in the Alleghany mountains ; the other a Carabid, *Nomius pygmæus*, which is found in Oregon and Washington, Lake Superior, Ottawa, Canada, Nova Scotia, and on the high mountains of North Carolina. Our commonest lady beetle, *Megilla maculata*, is found as far south as Chili, though at sea level, a large and developed variety occuring in the *Amazon district* of South America.† Our *Pyrameis hunteri* has also been taken in Peru, at an altitude of 9,800 feet above the sea. The White Mountain Butterfly, *Œneis semidea*, as is well known, occurs in the White Mountains of New Hampshire, Labrador, and on the high mountains of Colorado. There are other equally interesting illustrations of this southward trend of arctic and boreal species, but I have not time to enumerate them. I will close this paper, however, by a significant statement made by Dr. Henry Skinner in the *Canadian Entomologist* of October, 1893, as follows : "In the species that fly from the Atlantic to the Pacific, and also exist in Europe, it will be found that the Pacific coast examples far more closely resemble European ones than those individuals found on the Atlantic slope."

THE IMPORTED WILLOW AND POPLAR CURCULIO.

Cryptorhynchus lapathi Linn.

BY F. M. WEBSTER.

My reason for treating this insect at considerable length at this time is, that it has passed the Alleghany Mountains and entered the middle west, having been found the present autumn near Ashtabula, in the extreme northeastern Ohio, by one of my assistants, Mr. A. F. Burgess, acting under my direction. Previous experience with imported insects that have made their way to the west, led me to believe that we should sooner or later find it in Ohio, and that it

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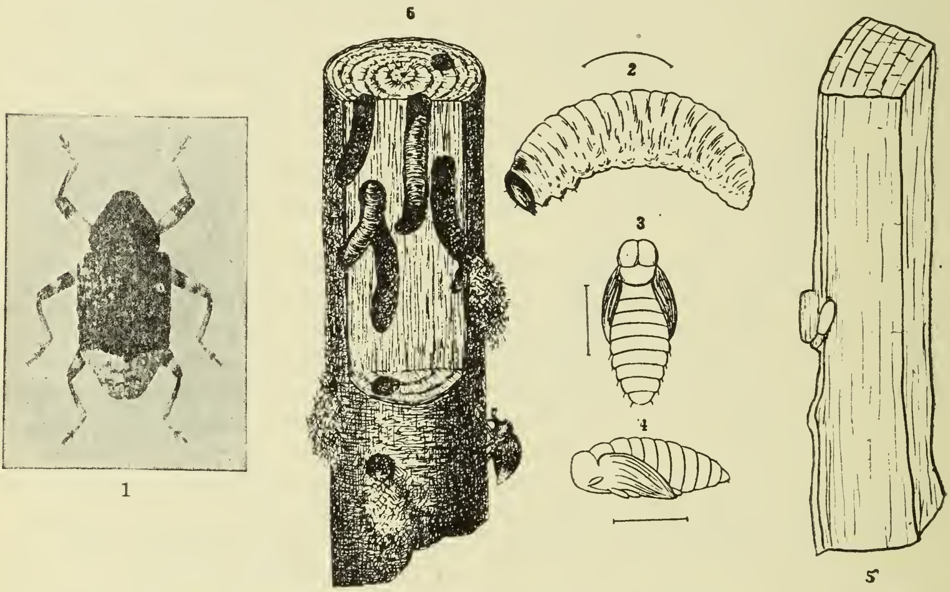
* Proc. Ent. Soc., Washington, Vol. I,. p. 186.

† Travels Among the great Andes of the Equator, Appendix, p. 57.

would first appear in that part of the State, therefore Mr. Burgess was instructed to search for it this fall as opportunity offered, and a single female was found in the act of ovipositing on Oct. 5th, in willow, growing along a small stream just east of the City of Ashtabula.

Description of the Mature Insect.

The insect is one of the snout beetles or curculios, related to the plum curculio, but much larger, being from 6.5 to 7.5 mm., about one-third to three-eighths of an inch, in length ; body dull black with little spots or tufts of jet-black scales or hairs on the thorax and wing covers ; scattered over the forward half of the wing covers are minute white scales which almost cover the posterior third, and form a somewhat V-shaped marking between this and the thorax. The body is coarsely pitted, and the femora, or first joints of the legs are spined. Plate, Fig. 1.



The Imported Willow and Poplar Curculio.—(Webster.)

Figure 1, *Cryptorhynchus lapathi*, adult, enlarged. Original.
Figure 2, larva ; figures 3 and 4, pupa. After Jack.
Figure 5, egg enlarged, as placed by female in bark of willow. Original.
Figure 6, illustrating larvae burrowing in the solid wood. After Jack.

Description of the Larvæ or Young.

When fully developed these are fleshy, footless, whitish borers, having somewhat the appearance of grubs, with small brown heads and darker brown jaws. Plate, Fig. 2.

Distribution of the Species.

The insect is common in Europe, ranging over Siberia and Japan, but whether it extends further south into Central Asia is not known. In the United States it is known to occur from New Jersey to Massachusetts, and westward through New York and in north-eastern Ohio, having without doubt pushed its way along the south shores of Lake Erie, from Buffalo, N.Y , where it was first observed in the summer of 1896.

History of the Species in Other Lands.

The species was described by Linnæus in his "Systema Naturæ," in 1763, its habitat being given as Europe, and found on *Salix* and *Rumex*, willow and dock. Later, it received attention from Fabricius in his "Systema eleuteratarum, 1801 ; Syst. Entomologia, 1775 ; Spec. Insectorum, 1781 ; Entom. Systematica, 1792," and later by Zetterstedt, Mathieu and Kaltenbach. It is included in Turton's Linnæus, 1806, Vol. II., p. 231. Ratzeburg, in his "Die Forst-Insecten," 1839, p. 155, briefly characterizes the insect, and states that it takes its name from the large-leaved dock, Lapathum, of the ancients, on which it sometimes sits. In Silesia it is called the alder destroyer (Erlenwurger). In July, 1824, in the vicinity of Liegnitz, a whole alder plantation was destroyed by it, and even a large number of trees ready for cutting did not escape. Willows were also destroyed by it. Nordlinger, in "Nachtrage zu Ratzeburg's Forstinsekten," 1856, p. 15, says that, according to Herr Suffrian, it occurred on low willows four or five feet high at the bases of the branches, and also on these last, and in June and July it was found in great numbers at Hohenheim on Canadian poplars, and also on white willows, where it would remain for hours with its snout buried in the spongy linticels.

Herr Hahn, wood commissioner of the district of Laupheim, observed in the forest of Ochsenhauser, on a strip of land on which both deciduous and coniferous trees were growing, that the birches five to eight feet high were broken off about three feet below the top, and were hanging down. One inch below the break was a worm-hole filled with worm-dust and wood shavings, in each of which was found a yellowish white larva with a brown head, which, after from eight to fourteen days, developed into one of these curculios. Herr Hahn considered that in this case the insect had destroyed the growth of two years.

In 1867, Brehm and Rossmassler, in "Die Thiere des Waldes," Bd. II., p. 171, under the term "Der Erlenrusselkafer," state that they have only noticed the insect in the mountain region, where it constantly works on the white alder, *Alnus incana* L., hardly a bush along the brooks and forest borders being free from the pest, the branches and trunks attacked readily breaking off.

In 1868, Ratzeburg again takes up the species in his "Die Waldverderbniss," dealing with it much more thoroughly than he had been able to do in his previous writings, and calling attention to the observations of Zebe and Herr V. Kamptz, relative to the injuries done by the insect, the latter having observed the habits of the beetle in Mecklenberg-Strelitz for many years. He states that an annual generation is the rule, and hibernation, therefore, occurs in all stages, most seldom in the larval state. The point that the beetle prefers isolated trees and does not like a wet locality well, is repeated, but he is still reluctant in classing the black alder as a common food plant, though not doubting that it is one of the food plants. In 1869, in "Die Waldverderber," pp. 171, 172, he states that the eggs are laid in May, the normal season, usually on alders—the black rather than the white—much more rarely on poplars, birches and willows, and the beetle prefers the young shoots or branches two to three years old. He is seemingly much perplexed over the fact that, while the beetles pair and the females oviposit normally in May, they were also abundant in August.

In 1881, Dr. Bernard Altum. in "Forstzoologie," III. Bd. abth., p. 220, opens his discussion of the species by the interesting statement that there are 221 species of the genus *Cryptorhynchus*, distributed over the entire earth, while Taschenberg, in "Brehm's Tierleben Insekten," 9 Bd., p. 163, 1892, states that *C. lapathi* is the only European representative of a South American genus. I may add here that we have now 16 species inhabiting North America, north of Mexico, the majority of them inhabiting the southern or south-western States. Dr. Altum wrestles with the life history, and does not clear up the obscurity, but states that while the sexes pair and oviposit in May, they may be observed pairing in September. there being a noticeable falling off in point of numbers during July. He leaves the subject by allow-

ing a two year generation ; that is, covering a portion of two calendar years, but completing their life cycle within twelve months.

The life history is given as follows, as observed in Silesia. Here, again, the white alder was seemingly preferred. The larva first works flatways under the bark, and then goes straight, ascending into the wood. Fig, 6, Plate. The larva makes the first chamber under the bark the first summer, and af er hibernation begins to excavate its gallery into the sound wood, ascending as a steep passage—sometimes as a broken one—still directly into the sap-wood, and before pupating the larva reverses its position and lies with its head downward in the burrow. Besides the white alder *Alnus incana*, black alder *A. glutinosa*, and of the willows, *Salix purpura*, *S. viminalis* and *S. triandra* are given as food plants, coupled with the statement that the willows along the railroads were badly injured, and in many places entirely destroyed by the ravages of this insect.

Judeich and Nitsche, in "Lehrbuch der Mitteleuropaischen Forstinsektenkunde," II. Abtheilung, 1889, deal at length with the insect, but do not clear up the obscurity in its life history, viz., do the beetles emerging in the fall come from eggs laid in the spring of the same year, or from those laid the preceding year ? The eggs are, for the most part, deposited singly in the bark of young alders, both black and white, and willows, including, besides those previously mentioned, *Salix cuprea*, and the larvæ eating out a hollow space under the bark, later force their way upward and deep into the wood. In case of small growths they work only in the centre. Before pupation the larva turns head downwards and prefers to hibernate in the larval chamber, climbing down the chamber when ready to emerge, and eating out a round hole in the bark for exit, near the place where the larval injury began. In proof that the beetles do not hibernate outside, the observations of Taschenberg are cited, who observes that where its dwelling-places about Halle were flooded during the winter, it was never to be found among the floating reeds and underbrush.

Eckstein, in "Zeitschrift fur Forst-und Jagdwdsen," XXIII,, Bd. 1891, p. 378, states that single willows in the forest botanical garden were attacked by this insect and badly injured. He also calls attention to the fact that, in badly infested stems, the larvæ frequently take a descending course instead of an ascending one, and also that the beetle does not gnaw a separate exit after leaving the pupal chamber, but follows the larval gallery, and makes its exit through openings made by external agencies.

Taschenberg, "Brehm's Tierleben, Insekten," 9 Bd., p. 163, 1892, states that on the banks of the Saal, near Halle, the larvæ live in the old gnarled root-stocks of the basket willows, causing these to die gradually, earlier than they would otherwise have done, and that in alder nurseries the larvæ do serious damage, and that they destroy plantations of young birch. Tubeuf, in "Forstlich-Naturwissenschaftliche Zeitschrift," I. Jahrgang, p. 387, adds the Alpine alder, *Alnus viridis*, to the list of food plants of the species, and finds fully developed beetles in the burrows in September, where the weather is cold and it frequently snows during that month.

History of the Species in America.

The first published record of the occurrence of the insect in America is by William Juelich, in "Entomologica Americana," Vol. III., p. 123, 1887. Mr. Juelich, early in June of that year, took a section of willow that had been blown down near West Bergen, New Jersey, and from it on July 3rd there emerged two adults, and later he succeeded in getting ten more from pieces of the same willow. He states also that he had, five years before (1882), collected a single specimen on willow near Williamsbridge, about twelve miles from where he secured his pieces of willow from which he reared the later specimens, and also that Mr. Ottomar Dietz had taken a specimen on Staten Island. From the pieces of willow Mr. Juelich also reared three specimens of an Ichneumon, *Ephialtes irritator* Fab., and, as no trace of other insects inhabitating the

pieces of willow could be found, it was presumed that the Ichneumon was a parasite on the beetle. In the "Canadian Entomologist," Vol. XXIII., p. 221, 1891, Prof. John B. Smith stated that nearly all of the clumps of willows near Arlington and Newark, New Jersey, and also some fancy garden trees had been killed by the insect. The next published notice is by myself in "Journal of the New York Entomological Society," Vol. V., p. 30, March, 1897. In company with Mr. Ottomar Reinecke, of Buffalo, I had, on August 24th of the preceding year, taken the insect in considerable numbers near that city, where it had only just been discovered by Mr. Reinecke. Dr. A. D. Hopkins, of Morgantown, W. Va., also accompanied us, and larvæ (Plate, fig. 2), pupæ (figs. 3 and 4) and adults (fig. 1) were all secured. My beetles were collected in a cyanide bottle, strongly charged and freshly made. The beetles remained in this bottle some six or seven hours, when they were removed and placed in small tin boxes. The following morning, the 25th, they gave no signs of life, but after I had returned home, on the 29th, not only were all of them found alive when I opened the box, but several of them were pairing. They were then placed on willow, but, though they did a large amount of puncturing, and would remain for hours with their snouts embedded in the bark, as has been observed in Europe, I was not able to secure a single egg, though some of the beetles survived until early in November (loc. cit., p. 204).

The next contribution to American literature relative to the pest, is by Mr. J. G. Jack, of the Arnold Arboretum, in "Garden and Forest," Vol. X , p. 394, October, 1897. Mr. Jack states that the insect had been known about Boston and Cambridge, Massachusetts, for many years, and for several years had been destructive to almost all species of willows growing in the Arboretum. It had been found burrowing in nearly all of the native willows except a few mountain or very slender stemed species, too small to afford sufficient tissue in which to excavate their chambers or feed freely. (Plate fig. 6.) Of the foreign species of willows, the white willow, cracked willow and laurel leaved willow, were all affected, but less seriously than the Babylonian weeping willow. All of the species of poplar in the Arboretum, particularly while young, had been attacked, and to a less extent the dwarf birch, *Betula pumila*, and the Red River birch, *B. nigra*. So abundant was the pest, and so extensive its ravages, that it was hardly possible to find a good healthy plant among the scrubby willows about Boston. The beetles were found on the bark, and sometimes on the foliage, in July and August. Other information is given, taken from European authors.

In "Psyche," Vol. VIII., p. 371, June, 1899, Mr. A. H. Kirkland calls attention to the fact that, about some of the shore towns in eastern Massachusetts, this insect has become a serious enemy to the Balm of Gilead trees, which, on account of the somewhat marshy land, constituted by far the most common shade tree, and so great was the injury that at that time it was almost impossible to find a sound tree of this species, all having been weakened by the attacks of this borer, and later broken down by the ice storms and high gales. Serious damage in nurseries is also recorded. Mr. Kirkland began in June, 1897, a study of the life history of the species in this country, and as he has very kindly placed his notes in my hands for use in the preparation of this paper, I take pleasure not only in appending them herewith, but in thanking him most heartily for allowing me to use them. I am also further indebted to Mr. Kirkland for translations of the European authors from which I have so freely drawn. The notes just mentioned are as follows :—

June 30, 1897. Larvae abundant at Winthrop, Massachusetts, boring in Balm of Gilead trees ; larvae nearly full grown, and some forming cells to pupate. Before pupating they enlarge their burrows to the outlet, then retreat to the upper end and transform in a neat chamber. 57 larvae taken from a stick 1½ inches in diameter, and 2 feet long.

July 3, 1897. Larvae common at Saugus, Massachusetts, in our native trembling poplar.

July 4, 1897.	Many small beetles (*Ips fasciatus* and its allies) abundant in filth which oozes from the burrows.
July 14, 1897.	From the middle of June to the middle of July sap flows freely from exits of burrows. Pupa always headed towards exit. Large infested branches wilt and die.
July 22, 1897.	In infested branches taken June 30th, beetles are matured to-day. I split open branches every day from June 30th on, and found nearly all the larvae pupated July 3rd and 4th. Eighteen days will pretty closely cover the length of pupal stage.
July 28, 1897.	Plenty of beetles in the infested sticks and only one pupa found. But few of the beetles have emerged from the burrows as yet.
July 31, 1897.	Beetles emerging freely.
August 17, 1897.	Beetles common. Feeding on petioles and poplar leaves.
May 22, 1898.	Captured one imago at Medford. Probably an over-wintered specimen.
May 29, 1898.	Found plenty of larvae in native willows at Medford. This shows that the insect breeds in our woodlands
June 6, 1898.	Larvae are feeding rapidly and throwing out worm-dust from their burrows.
June 15, 1898.	Larvae boring in *Populus monilifera*, at Bedford, Massachusetts.
June 27, 1898.	Larvae nearly full grown.
July 5, 1898	Beetles mating at Medford.
July 10, 1898.	Larvae beginning to pupate, the date being later than last year. The small larvae hibernate in the cambium, enter the wood in the spring, and make a rapid growth to maturity. The base of young trees is a favorite point of attack ; older trees are more difficult to affect.
July 16, 1898.	Found larvae boring in silver poplar (*Boliana poplar*).
July 30, 1898.	Beetles abundant at Springfield, Massachusetts, along the Connecticut River ; feeding on the cotton wood.
September 15, 1898.	Imagoes mating at Malden.
September 21, 1898.	Beetles abundant and feeding on petioles and young twigs, at Winthrop, Massachusetts.
April 5, 1899.	Found minute larvae under leaf scars in poplars at Abington, Massachusetts. Larvae $\frac{1}{16}$th of an inch long, curved, pale greenish, and only slightly active.
May 10, 1899.	Young larvae abundant in bark beneath leaf scars on poplars at Winthrop. Burrows about one inch long now mainly in the bark, and full of black castings.
May 18, 1899.	Larvae now entering the wood, having finished feeding in the bark.
June 4, 1899.	Larvae 7 to 10 mm. long and feeding rapidly.
October 2, 1899.	Found eggs of this insect for the first time, in poplars, at Wyman's Nurseries at Abington. They were wedged in under the bark in cavities at the base of young branches. The beetle gouges out a hole for each egg, and leaves from one to four in a spot. In some of the infested sticks the eggs have hatched and the tiny larvae have commenced feeding. This finding of the eggs closes the gap in the life history of the insect.

Unless there are adults in spring, which, as in Europe, deposit eggs in May, and Mr. Kirkland overlooked these, which is hardly possible, he has given the full life history, for the first time. It is possible that the single annual brood is not, as seems to be the case in Europe, intercepted by winter. Certain it was that the insect was pairing at Buffalo, N.Y.,

August 24th, 1896, and ovipositing at Ashtabula, O., on October 5th, 1901, though in this latter case it might have been by a belated female. Mr. Burgess examined many poplars in the city of Ashtabula without finding the insect, and but a single female was to be found on the willows in a deep ravine near the city. This female was observed in the act of oviposition, the place selected by her being one of the corky growths, common on the willow bark. The day was cool, and the beetle worked on the south side of the tree, pushing her snout into the corky bark as far as it would extend, and worked it about so that quite a cavity was excavated. She was thus engaged when found, and continued to work for forty minutes. At the end of this time she reversed her position, and, placing her ovipositor in the cavity, forced it in the entire length, her position at the time being parallel to the ground. After remaining motionless for three minutes she began to move the abdomen and ovipositor upward and downward, and, though something could be observed passing into the cavity, whether the egg or some mucilaginous matter could not be determined, but in any case, when she had finished her work the cavity was completely closed. Turning about again she seemed to examine her work with snout and antenna, and, apparently satisfied therewith, she sought out another similar corky growth and began her work when she was captured, remaining alive, however, until October 10th. The section of willow showing the egg as it was placed by the insect is shown by fig. 5, plate. It will be noticed that it was jammed into place, and probably packed securely with the surrounding tissue, reduced to pulp by the jaws of the beetle.

The egg is oval, pale yellowish white ; length, 1.5 mm.; width, 0.8 mm.

It would appear from the foregoing that this insect has come among us to attack our willows, poplars and probably some other shade and ornamental trees that are found in our parks, cemeteries and other public grounds, as well as along our streets ; also, that it is a nursery pest as well. The Carolina poplar, on account of its symmetrical form and rapid growth, has been very largely planted during the last ten years, and it remains to be seen what effect this foreign insect will have upon these, especially as Mr. Kirkland informs me that, at present, the species is a serious pest in nurseries where poplars and willows are propagated, and on low lands where these are the principal shade trees.

Prevention.

If, as now seems to be the case, the insects live over in the bark as very young larvae, it will be difficult to detect their presence until the next summer, so that burning infested trees in winter will be impracticable, as the presence of the borer will only show after the injury has been done and the culprit escaped. Something may be accomplished by burning in late spring such trees as are seen to be infested, thus destroying the pest before it develops and escapes. The outlook, however, is not encouraging in the matter of protecting trees from attack.

THE COMMON CHEESE MITE, TYROGLYPHUS SIRO, LIVING IN SPOROTRICHUM GLOBULIFERUM.

By F. M. Webster.

Since the year 1896 I have been distributing from one hundred to several thousand small boxes of this fungus each year to farmers in Ohio, to be used against the chinch bug, *Blissus leucopterus.*

In the preparation of this fungus for distribution, we have followed the more recent method of cultivating it in quantity on a base of sterilized beef broth and corn meal, but recently an unexpected difficulty has arisen in the shape of the ravages of the common cheese mite, which makes its way into the boxes of the prepared material, after it has been dried and put away for use, and reduces the contents of the boxes to powder, so that it is simply a crawling mass.

Curiously enough, despite the attack of these mites, one of my assistants, Mr. Newell, took a quantity of this mass of powdered meal and mites and with this was enabled to get a fine culture in a bottle of the sterilized meal and broth dough.

The mite attacks not only cheese but sugar, flour, cured hams, wool, seeds and many other articles of food and commerce. Evidently it is in this case the dough that attracts them, but as against them this species of entomogenous fungi is clearly harmless.

THE HIBERNATION OF INSECTS.

By Prof. W. Lochhead, Ontario Agricultural College.

A very puzzling question, yet a very important one, is frequently asked : "Why do some insects pass the winter as adults ; some as pupae ; some as larvae ; and others in the egg stage ?"

To answer this question the entire history of the development of insects would require to be known, for there seems to be but little doubt that the particular hibernation form is the visible expression of the influence of many factors, such as change of environment, nature and abundance of food, and change of habit. The question of hibernation is clearly closely associated with that of metamorphosis, and any intelligent discussion of hibernation must necessarily deal with the causes of metamorphosis. When this connection is realized, it is plain that in dealing with hibernation forms of insects we are dealing with one of the most difficult problems in biology. No attempt will be made here to solve the difficulty, but, perhaps, the presentation of a few facts regarding hibernation forms may be useful and interesting.

The members of the order *Orthoptera*, almost without exception, hibernate in the egg stage; the *Hemiptera* mainly in the egg, or adult condition ; the *Neuroptera* as larvae ; the *Lepidoptera* in the egg, larval, pupal, or adult condition ; the *Coleoptera* as pupae or adults ; the *Hymenoptera* as larvae or pupae ; the *Diptera* as larvae, pupae, or adults.

According to the foregoing, it would appear that the insects that pass through an incomplete metamorphosis have but one, or at most two, forms of hibernation, while the insects which pass through a complete metamorphosis have several forms of hibernation.

When we remember that the modifications in the stages of metamorphosis are modifications in the form and functions of organs in adaptation to a changed environment, it becomes evident that the insect may winter over in any one of the four stages. That stage will be chosen which will suffer least by the change of environment. For example, in those forms whose larval existence is spent in semi-liquid decomposing matter, it would be practically disastrous for them to remain as larvae, when intense cold sets in and changes the condition of the medium. They are more likely to survive as pupae, or adults, in a dry medium.

With reference to metamorphosis, insects are divided into the *Hemimetabola*, or those with an incomplete metamorphosis, and the *Holometabola*, or those with a complete metamorphosis. In the former there is a gradual change from the larva to the perfect insect, while in the latter the insects pass through a resting pupal stage.

With regard to the stages of development, some of them show better adaptation to hibernation than others, although it is impossible at present to explain why some butterflies winter over in the adult state and others in the chrysalis ; or why some flies winter over in the larval state, some in the pupal, and others in the adult.

Brief notes of the stages will be given here beginning with the Egg, dwelling chiefly on characters which enable the insect to hibernate.

The Eggs. Eggs of insects are protected by two coats or membranes, an inner *vitelline* membrane, and an outer *chorion*, composed of two layers. When eggs are laid in situations exposed to the weather and cold, the shell, or chorion, is very solid, and sometimes strengthened

by ribs and ridges. Within the coats of the egg are the yolk-mass and the germinal vesicle, which lies within the yolk-mass. The amount of yolk-mass is usually large, and it is claimed by Brauer that the eggs of insects which undergo incomplete metamorphosis contain relatively more yolk than those of insects with complete metamorphosis. As the germinal vesicle lies within the yolk, it is securely protected against changes of temperature and moisture, as the yolk is mainly composed of fat globules. The eggs of some insects possess remarkable vitality, such as those of the "Walking Stick," and Bittacus, which survive two or more years.

Naturally, then, we might expect to find some insects in all the Orders hibernating in the egg state. The following common forms winter as eggs :—

Plant-lice (*Aphididae*).
Tree-Hoopers (*Membracidae*).
Leaf-Hoppers (*Jassidae*).
Most Scale Insects (*Coccidae*).
Leaf-bugs (*Capsidae*).
Grass-hoppers (*Acrididae*).
Locusts (*Locustidae*).
Crickets (*Gryllidae*).
Walking-Sticks (*Phasmidae*).
Gipsy Moths (*Ocneria dispar*).
Fall Canker Worm (*Palaeacrita pometaria*).
Tussock Moth (*Orgyia leucostigma*).
Tent-Caterpillars (*Clisiocampa Americana*, and *C. disstria*) (fig. 33).

Fig. 33. Egg-cluster of Tent Caterpillar.

The Larvae. Insect larvae differ from the immature forms of other invertebrates in the possession of the systems of organs and the same number of segments in the head, thoax, and abdomen. When ready to pupate the larvae are always larger than the adults.

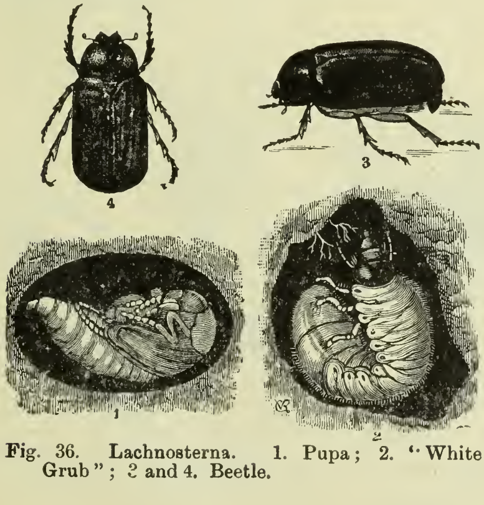


Fig. 36. Lachnosterna. 1. Pupa; 2. "White Grub"; 3 and 4. Beetle.

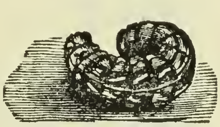


Fig. 34. Cut-Worm.

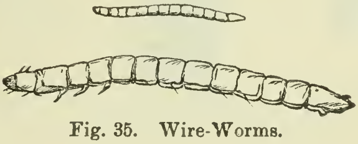


Fig. 35. Wire-Worms.

From the fact that the larval stage is the growing time of the insect it is not to be expected that hibernating larvæ will often occur. Moreover, the relatively large amount of fluids within the body of the larvæ, and the thin dermis just after moulting, make them extremely sensitive and liable to injury from freezing and other temperature changes.

Some insects, however, do hibernate as larvæ, but these are all protected in the ground, and in the mud at the bottom of ponds, or in specially constructed cocoons, or other covering. The following insects hibernate as larvæ :

Codling Worm (*Carpocapsa pomonella*).
Bud-Moth Caterpillar (*Tmetocera ocellana*).
Most Cut-Worms (*Noctuidæ*), Fig 34.
Peach-Tree Borer (*Sannina exitiosa*).
Blister-Beetles (*Epicauta Pennsylvanica E. vittata, E. cinerea*).
Joint-Worms (*Isosoma tritici*).
Hessian Fly (*Cecidomyia destructor*). as "Flax-seed."
Ichneumon-Fly (*Ichneumonidæ*).
Ant-Lions (*Hemerobiidæ*).
Wire-Worms (*Elateridæ*), Fig. 35.
White Grubs (*Lachnosterna fusca*)., Fig. 36.
San José Scale (*Aspidiotus perniciosus*).
Crambus Moth (*Crambidæ*).

The Pupæ. True pupæ only occur among insects which undergo complete metamorphosis. As the pupal period is the resting, inactive stage, when no food is taken, and when the pupa

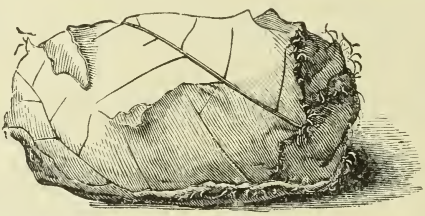


Fig. 38. Telea polyphemus cocoon.

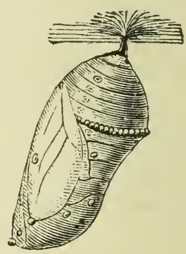


Fig. 41. Chrysalis of Milkweed Butterfly (Archippus).

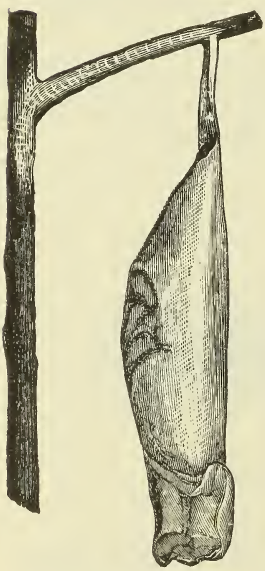


Fig. 37. Attacus promethea cocoon.

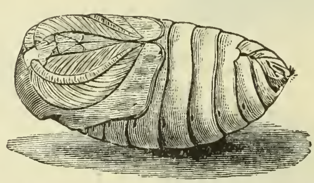


Fig. 39. Telea polyphemus chrysalis from interior of cocoon.

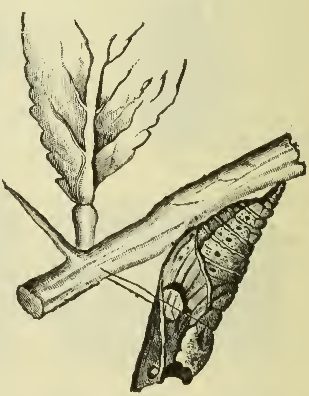


Fig. 42. Chrysalis of Papilio Cresphontes, showing mode of suspension.

itself is protected by a thick, chitinous, impervious coat, by a thickly-clad silk cocoon, or by an earthen cell in the ground, the majority of insects usually pass the winter in this stage. In this stage, the circulation and respiration is much lessened, while the supply of fat stored up by the larvæ is sufficient for the needs of the pupa.

It is interesting to study the pupal forms of insects, with reference to their adaptations to their surroundings. When pupæ are incased within cocoons (Figs. 37, 38, 39) or earthen cells (Fig. 36) they are smooth and rounded, but when chrysalids are formed, such as is the case with butterflies, and when there is considerable exposure to wind and weather, they are rough and angular (Fig. 40 *b*). The chrysalids of the Nymphalidæ, to which the Milk-Weed Butterfly belongs (Fig. 41), are all suspended by means of a button of silk to the under surface of some object, and they swing freely. It is plain that the "horny tubercles and roughened, calloused ridges" of such chrysalids protect the swaying bodies. The chrysalids of the Papilionidæ (Fig. 42),

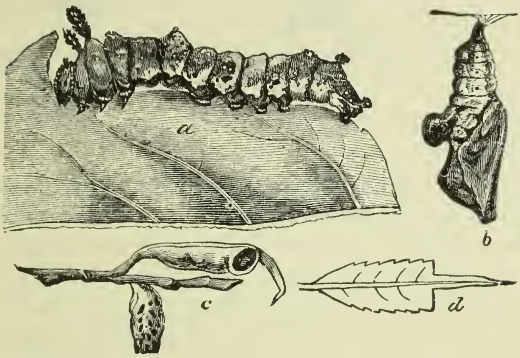


Fig. 40. *a*, Larva; *b*, chrysalis of Limenitis disippus butterfly, showing angulations and mode of suspension.

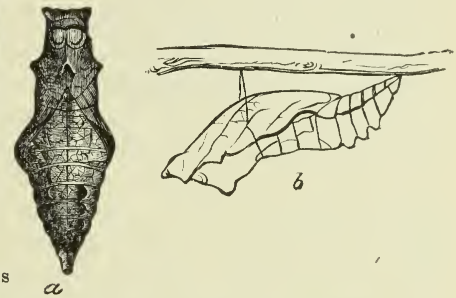


Fig. 43. Chrysalis of Papilio philenor. *a*, Back view, showing angulations; *b*, side view, showing mode of suspension.

to which our Swallow-tails and Cabbage-butterfly belong, are held in place both by a button of silk and by a girdle of the same material, which passes around the middle of the chrysalis.

Among the common insects which hibernate as pupæ are :

The Sphinges (*Sphingidæ*).
Cabbage-butterflies (*Pieris rapæ*).
Cecropia (*Samia cecropia*).
Polyphemus (*Telea polyphemus*).
Corn-Worm (*Heliothis armiger*).
Army-Worm (*Leucania unipuncta*)
Datana Ministra.
Spring Canker-Worm (*Palæacrita vernata*).
Pea and Bean Weevils (*Bruchus pisi*, *B. obtectus*)
Squash-Borers (*Melittia ceto*).
Potato Beetle (*Doryphora decemlineata*).
Saw-flies (*Tenthredinidæ*).
Phorbia.
Oberea bimaculata.
Pear Midge (*Diplosis pyrirora*).
Clover-seed Midge (*Cecidomyia leguminicola*).

The Adults. Many insects in their adult condition are strongly chitinized and otherwise protected against wind, cold and rain. Such forms are well able to hibernate, more especially in the dormant condition. Among common forms are :

Grape-vine Flea-beetle (*Haltica chalybea*)
Plum Curculio (*Conotrachelus nenuphar*)
Potato-stalk Borer (*Trichobaris 3—notata*)

Asparagus Beetles (*Crioceris asparagi and C. 12—punctata*), Figs. 16, 19.
Potato Beetles
Cucumber Beetles (*Diabrotica vittata, D. 12—punctata*), Figs. 44, 45.
Buffalo Carpet Beetles (*Anthrenus scrophulariae*)
Bark Beetles (*Scolytidae*)
Squash-bugs (*Anasa tristis*)
Lace-Bugs (*Tingitidae*)
Chinch-bugs (*Lygæidæ*)
Stink-bugs (*Pentatomidae*)
Pear-tree Psylla (*Psylla pyricola*)
Leaf-Hoppers (*Jassidae*)
Green-fruit Worm (*Xylina*)
Mourning Cloak Butterfly (*Vanessa antiopa*)
Army Worm (*Leucania unipuncta*)

Fig. 44. Diabrotica Vittata.

Fig. 45, Diabrotica 12—Punctata.

The more the question of hibernation forms is studied, the more difficult it seems to account for the great number of variations ; at the same time it becomes apparent that the particular form assumed during winter can only be determined by a study of the phylogeny of the insect. All Zoologists are not agreed as to the probable habitat of the primitive insects, but the bulk of the evidence points to them as land-dwellers and not water-dwellers. That the primitive adult insects were wingless and like the larvae is also conceded. They were ametabolic, that is, undergoing no metamorphosis. Our Thysanurans are supposed by some Zoologists to reveal many of the characters of the primitive insects. They live in damp places, under stones and rubbish, and are protected by these objects during winter, and there is no need for any special hibernation form. We can readily imagine, however, that as the numbers of the primitive insects increased, a "struggle for existence" would arise, and natural selection would choose out those forms that by accident, or otherwise, adapted themselves to changed conditions, either on land, in the air, or in the water. Tracheal gills of aquatic larvae may be regarded as an adaptation to an aquatic condition, and wings as an adaptation to an aerial existence. When insects possessed wings, environmental changes would be great and there would arise the necessity for a "Division of Labor" on account of the difficulty in securing food during the winter season. The larval stage was devoted to the acquiring of food, and to growth, and the adult to reproduction. Then came the pupal stage, as an act of necessity, to bridge over the gap between larva and adult, when preparations could be made for the complete formation of the adult. According to this, the pupa would be the normal hibernation form for most insects in our latitude.

ANOSIA ARCHIPPUS DOES NOT HIBERNATE.

By J. Alston Moffat, London, Ont.

The method of explaining the unobserved portions of the life history of *Anosia Archippus* by analogy, or bringing them into conformity with what was known in the life history of other butterflies, has retarded rather than assisted in removing the difficulties connected with it. There are several peculiarities in the life history of that butterfly which have been often enough observed to place them amongst the established laws of its nature, that are so different from anything known in the life of other butterflies, that it becomes necessary to seek an explanation of the unobserved portions of its history, in accordance with what is known in its own life rather than in the life history of other butterflies.

For instance, it does not pass the winter in the mature state in this locality. Nor can it survive it in any of the stages of its existence in its northern breeding grounds ; hence after

each succeeding winter these regions where it is produced in the greatest abundance have to be replenished in the spring by individuals coming from the south. (Using these geographical terms in an undefined manner). Its noticeable habit of congregating in immense swarms in the north at the end of summer, combined with their utter disregard for each other sexually, whilst closely associated with each other individually for so long a time, is without a parallel in any other known species and therefore has a special significance of its own. Then the fact that these swarms move off together on the approach of winter, as if by mutual understanding, in a southerly direction, combined with the fact that similar swarms have been observed on more than one occasion wintering in the south, where such multitudes could not have been bred on account of the scarcity of their food plant there, clearly indicates that they had come from the north where they are bred in such profusion. When I wrote my paper for the 31st annual Report of the Entomological Society of Ontario, 1900, although quite convinced that *Anosia Archippus* was not a hibernating butterfly, yet I could not produce the evidence necessary to sustain and justify my belief, so I sent a copy of that report to Dr. Thaxter with a note calling his attention to it, that he might have an opportunity of correcting any erroneous conclusions I had arrived at, if he thought necessary. In return I received a most genial acknowledgement from the doctor, from which I have the pleasure of copying the following statement which is connected with the subject in hand :

"About those Archippus butterflies I have a memorandum on the sketch which I made at Appalachicola [which was published in the *Canadian Entomologist*, vol. xii. (1880) page 38], Fig. 46 to the effect that it was drawn from nature January 3rd, 1873. If I remember rightly the butterflies did not begin to scatter till February and then many were seen in coitu."

That appears to be conclusive and makes it certain that those flocks of *Archippus* butterflies seen by Dr. Thaxter in Florida (Fig. 46), were not there in search of a place to hibernate, but with the intention of passing the time in an active state until their season for breeding had arrived. The chain of evidence now seems to be complete, although every link in that chain has not yet been forged ; that those immense swarms that come together in the north where they were produced in such profusion, take their departure in flocks from the north for the very purpose of going south to winter there. Not always in a direct line but always tending in that direction, their movements are influenced by the nature of the route and the character of the weather. Not rushing impetuously onward to their destination as some butterflies are reported as doing, "Entomologist's Record," vol. xiii., page 98, but as becoming their regal character, deliberate and dignified in all their movements ; enjoying their journey and the novelties of the way ; having none of the distractions of family affairs to disturb their equanimity, being quite conscious that the serious business of their life is well off in the future and that in good time they will reach a suitable locality where they may spend the winter in comfort and safety.

Fig. 46.

Having thus obtained a satisfactory explanation of their autumnal gatherings in the north, as part of their constitutional habit of wintering in the south, one may regard that portion of *Archippus* life history as conclusively settled, and turn our attention to its spring movements, and enquire, when and from whence do the northerly migrations originate? In the absence of observed data we will have to be guided in the formation of our opinions on the subject, by the well known habits of the butterfly, and the climatic conditions of the localities it frequents.

Those swarms of *Archippus* that were seen wintering in Florida, probably reached that locality from somewhere in the north, about the end of November. They broke up in February and dispersed. Then, as is naturally to be expected, the sexual desires which had for so long lain dormant were aroused, and they prepared to carry out the purpose of their existence, namely, the multipl cation of their kind. With that end in view they must first find *Asclepias* the food-plant of their progeny ; reported to be always scarce in Florida, and in February probably no fresh plants of it to be seen there. Where then are they to obtain it? Certainly not by going northward at that time of the year, but by going still further south.

Prof. Riley as early as 1878 made observations upon southerly spring movements, but being confused with the hibernating theory he failed to realize their full significance. From an article in the "Scientific American" for April 6, 1878, a part of which he produced in the "American Entomologist," Volume III., Page 102, I copy the following that bears on the subject. After giving his view of their manner of spreading northward in the summer, and their flocking to the south in autumn, he says:

"We can thus understand how there are two, three or more broods in southerly regions, but only one toward British America. The exceptional flights noticed in the spring, and which, so far as recorded, take place quite early and in the same southerly direction, find a similar explanation. They may be looked upon as continuations of the autumn flights. Hibernating in the temperate belt, the butterflies are awakened and aroused upon the advent of spring, to find the milk-weeds not yet started, and they instinctively pass to more southern regions, where spring is more advanced."

Eliminating from that statement the hibernating idea, it is otherwise quite in accordance with what we know of the habits of the butterfly. Whilst the region of which Dr. Riley was speaking being Texas, Indian Territory and Kansas, where the autumn flocks would be gathered from a different part of the c ntinent than those came from which were seen in Florida, their movements would be influenced by the character of that region, yet their natural disposition would remain the same, which is to move on and extend the species where ever it can find suitable conditions. Now the whole literature of the species testifies to its being a wanderer. Yet we know by its conduct in the north that it does not wander aimlesly. It seems to have a purpose and "a method in its madness" in that respect which looks wonderfully intelligent.

That habit being constitutional to the species, it will be found in some measure to influence every individual of it and control its movements to the utmost limits of its southern habitat on this continent, therefore, we are not warranted in restricting its northerly migratory movements in the spring to those individuals found in the more northern portions of its southern home. For those northern bred specimens that wintered there, when they have been aroused to activity by the approach of their breeding season, will move southward for we know not how far, depositing eggs as they go before they are exhausted, whilst at the same time, those born in extreme limits of its southern breeding grounds, impelled by that intense desire to travel and spread its kind will be moving northward. Thus migrations in opposite directions will be going on together ; and it may yet be discovered, that the majestic sweep of that annual movement is far more extensive, regular and continuous than has ever been suspected.

On such considerations as these, in the absence of actual observations, we have to depend in forming our conclusions as to when, and from whence, the first arrivals in the north have their origin. Those that reach West Virginia about the end of March, would appear necessarily to come from somewhere much further south than Florida ; whilst those that reach Ontario about the end of May, might be born there or thereabout. But so much depends upon the character of the seasons, and the directness or otherwise of the flight of the butterflies, that all positive conclusions must be withheld. The climate of Florida is not always favorable as a winter residence for the butterfly. Cold waves from the north descend upon it at times,

so as to destroy the orange groves, and a few years ago a frost in the South nearly exterminated the blue birds, and for years after scarcely one was to be seen in Ontario, and only now are they becoming common, and it may be years yet before they are as plentiful as formerly.

Now, *Archippus* is not likely to survive a frost that killed blue birds ; yet no one in the north observed an unusual absence of Archippus in the following season, as was the case with the blue birds ; and yet the probability is, that a wide belt along the South Atlantic States was swept clear of this particular butterfly during that winter. So we see that such a widely extended migratory movement is necessary to maintain the regular northern supply for propagating purposes in that region.

In regard to the number of broods in a season produced by the species in its tropical home, we are as yet without information. But, from what we know of its nature and habits, it seems as if it would require several to enable it to complete its annual functions. That it has no well defined broods in the north is certain, and the long continued straggling nature of its oviposition supplies us with the reason for it. (Scudder's "Butterflies of Eastern U. S. and Canada," Vol. I. page 742). And as it will follow the same course in the South, it will make it very difficult to determine the number of its broods there. That Mr. Edwards has seen them pairing in W. Va. is indicated by his remarks when dealing with the subject ("Psyche," Vol. II., page 169), which may be regarded as illustrating its habits in that locality, but that there would be as many broods in nature as he obtained in confinement does not seem probable ; or that the butterflies bred there in nature would remain there to breed again is not at all likely, as it is not in accordance with its nature and habits to do so. I saw *Archippus* pairing on one occasion at Hamilton, in numbers, about the middle of June (Can. Ent., Vol. XX., p. 137), But singularly enough, it was the only instance of the kind that I ever witnessed ; and that single instance cannot be regarded as exhibiting the regular habit of the species in that locality, but rather as an unusual and exceptional occurrence, for which there would be some special reason if we only could trace it. I do not now consider that those pairing individuals that I saw would be the first arrivals of the season for that year, but rather that they belonged to a brood produced in some less distant locality, but yet had travelled far before they were ready to mate, and would proceed yet further north in conformity with the established habits of the species.

The desire to travel, which is so strongly developed in *Anosia Archippus*, and which is so strikingly disclosed in its regular migrations on this continent, which constrains it as it were to turn its head northward in the spring, and southward in the autumn, and holds it as rigidly to these points of the compass until it reaches the furthest limits of favorable breeding conditions, is a faculty of direction which we do not yet comprehend. The migrations of birds w l not assist us to unravel the mystery, as the old birds are supposed to guide the young ones on their first trip. The finding of their homes at long distances by cats, dogs and carrier pigeons does not apply, as in these instances it is with them a return journey ; none of our butterflies were ever over that road before. Sight avails them not. Scent, as we know it, cannot assist them ; and yet there may be an influence in the air affecting them that suggests both the time to start and the direction in which to go. We know that in some of the lower animals a particular sense can be found that is far more highly developed than the same one is in man. And we also know as a fact, although we cannot explain its operation, that there is in some of the lowest forms of life, where there is no nervous organization to receive an impression, a phenomenon termed "Heliotropism," signifying a turning towards the sun, which is as constant and certain in its operation as any other law of nature. Now, may there not be in these butterflies a sense perception of direction, of which we know nothing, but of whose presence they are perfectly conscious, and to whose promptings from without, they respond as readily as to their food, and which guides them as unerringly as in the choice of a food plant for their progeny? An influence in the atmosphere or from the sun, a kind of Heliotropism ; or one that

seems to combine all others, and one which is getting to be more and more acknowledged as pervading and influencing everything, whilst uniting objects the most distant, and, as it were, obliterating space, but which has not yet, in this direction, found a place in the domain of science, namely,—electricity and magnetism? An influence which so acts upon their sensibilities as to prompt them to move in unison, at the proper time and in the right direction,—confidently, but unconcernedly as to cause or consequences?

COLLECTING AT LIGHT IN 1901.

By J. D. Evans, Trenton.

Early in June last the writer commenced collecting at an incandescent electric light which was continued every night with very few exceptions until about the middle of September; the light was outside and in front of the front porch; immediately below the light was fixed a funnel made of heavy white paper, and below and contiguous thereto was placed a deep glass jar containing cyanide of potassium. This would be placed in position at dusk and left out (except when rain threatened) all night.

On a favourable night myriads of insect life would be taken, caddis flies predominating, but always accompanied by a goodly percentage of moths, beetles flies, and bugs, with a few Hymenoptera. Upon the most unpromising nights 25 or 30 moths would be taken, which would increase to 100 or 150, or more, on a favourable night. The subdued light shed by the white paper seemed to have a peculiar attraction for the insects, for very few entered the house although windows were open and rooms well lighted.

Of the moths some species were taken in large numbers, particularly micros. Among the varieties may be mentioned *Plusia contexta*, and *P. striatella*; also *Xanthia togata* and a number of species not yet determined.

Among the Coleoptera many families were represented, and many species rarely met with were taken in large numbers, a list of which will be prepared at an early date. Among the families most numerously represented may be mentioned Carabidæ, about 40 or 50 species, Hydrophilidæ, Nitidulidæ, Elateridæ, Scarabæidæ, Cerambycidæ, Chrysomelidæ, and Anthicidæ.

The Hemiptera were represented chiefly by fully 20 species of leaf-hoppers.

Very few insects were taken during the season other than by light.

I can record the capture of a fine specimen of *Papilio cresphontes* in the garden on the 20th August; it was hovering over a patch of Phlox Drummondii.

THE MILKWEED AT DUSK.

By Albert F. Winn, Montreal.

The attractiveness to insects of the flowers of the milkweed (*Asclepias cornuti*) has given rise to a new popular name of "Butterfly Weed" being applied to it. This name certainly appears appropriate enough to any one passing a patch of the plant in full bloom on a hot July day, with the blooms and the air around just alive with gay butterflies. But the entomologist wants something better than *Danais archippus*, the various species of *Argynnis*, *Limenitis disippus*, and *Pamphilas*, when he has a day to spend in the fields, and if he spends much time around the milkweed he will probably come home with a great quantity of specimens of a dozen species of the commonest of our butterflies, which he will carefully put away in papers to remain there till doomsday.

I have often wished to have the opportunity of watching the milkweed blossoms regularly in the evenings, but till this summer have not had the chance. In July of this year I spent my

fortnight's vacation at Fortune's Rocks, near Biddeford, Maine, and the day after my arrival I came across a fine patch of milkweed in the centre of a hayfield, the plants flourishing there owing to the ground in this spot being higher than the rest and rocky, so the mowing machines failed to do their deadly work. The usual array of butterflies were eager to quench their thirst, and an occasional bee moth, *Hemaris thysbe*, darted about from flower to flower. Being close to the house where I was staying I felt that now was the chance to see whether the plants were not something else than "butterfly weeds," and on the evening of July 8th I sallied forth at about 7.15, armed with a net and two cyanide bottles. The first insect I saw was a big dragon fly busily engaged among the mosquitoes, which were exceedingly voracious. Nothing was on the blossoms but a few belated ichneumons and bees when I first arrived, but about 7.20 the *Heliophila pallens* and *adonea* appeared in perfect swarms, crawling all over the blooms. At 7.30 it began to be more like twilight and something dashed through the field and hovered near me over the plants. My first shot missed it, but it soon returned to another flower head and was captured—a *Sphinx gordius* (fig. 48). A moment later I had another of the same kind. Then a smaller dark fellow appeared, evidently a hawk moth, but new to me—*Dolba hylaeus* (fig. 47.) With this and the first *gordius* in one bottle, and the second *gordius* alive in the other, I was beginning to wonder what I should do if another Sphinx came along. It soon came in the shape of *S. kalmiae* (fig. 49), so I put the three previous captures in one bottle and he *kalmiae* in the other, when another *kalmiae* hovered right in front of me, but before I struck at it I noticed a few steps further on another *Dolba hylaeus*, and thinking this too great a prize to miss on account of a *kalmiae*, I made a stroke through the plant and to my surprise found I had not only the *Dolba* but two *S. gordius* as well. Didn't the scales fly from their wings? By this time the patch was simply alive with Sphingidae, and having filled both bottles I returned to the house, but found most of the specimens had suffered through being put into too small a space while alive. I should have known better, but one who has been accustomed to catching perhaps a dozen Sphingidae in a season is not likely to abstain from catching as many as possible when occasion arises, therefore any one knowing of an isolated patch of milkweed in full bloom during the flying season of the Sphingidae should go prepared.

The following evening seemed even more favorable, and I took my whole stock of bottles, four in number, a tin box charged with cyanide, and a box with cotton wool in it.—and Mrs. Winn accompanied me with another net. As on the previous night it was about 7 30 before any Sphingidae showed up, about half a dozen *Dolba hylaeus* arriving simultaneously, then *Sphinx gordius*, these two being always first—perhaps because there were more of them. A *S. Kalmiae* then flew over the patch without settling down, and with a sudden raising of the wings of one side darted across the field again, only to return in a few seconds. The eye could easily follow this species in the partial light owing to the light brown color, and they were noticeably shy till it became almost dark, perhaps instinct taught them that their colors were not a protection while hovering over flowers and dark leaves, though what enemies they have other than human beings I do not know. We used the bottles one after the other, and when No. 4 was occupied the Sphinx in No. 1 was transferred to the cyanide box in case there might be any life left in him; then No. 2 into the box, and so on. Even then we could not kill them half quickly enough—and every minute some new kinds seemed to be appearing. *Philampelus achemon*, *Sphinx drupiferarum*, *Deilephila lineata*, *Darapsa chœrilus* and *myron* were plentiful, and a single *Sphnix luscitiosa*. There were so many specimens on the same head of flowers that it was difficult to pick out a particular one from among the humming throng. We soon found that making a stroke upwards was the only way to catch one at a time, a stroke through the blooms or downward over it meant at least a dozen—and pandemonium.

We soon got acquainted with the habits and appearance of the different species—the little *Dolba hylaeus* being easily noticed by its small size and dark color and keeping mostly to the

edges of the patch—*gordius* looking nearly black and twice the size of *hylaeus*—*drupiferarum* in turn seemed blacker still, the pale costa making it conspicuous—*S. kalmiae* was quite unmistakeable in its flight from flower to flower on account of its color—*Darapsa myron* and *choerilus* were easily picked out by their small size and different flight, and they even settled on the blossoms—the large bodied *Philampelus achemon* and *pandorus* were also as easily recognized in the semi-darkness as in a glass covered cabinet drawer.

Our second evening resulted in our bringing home over forty specimens, belonging to ten species of hawk moths.

I shall not take up more time with details of further evenings spent at the same spot, but every visit was time well spent. Many interesting specimens among the smaller moths were captured. *Plusias, Hadenas, Heliophilas and Mamestra* being in myriads some nights. On the last evening of my stay, July 20th, I caught only seven Sphingidae, but do not think their season

Fig 47.—Dolba hylæs.

Fig. 48.—Sphinx gordius

Fig. 49.—Sphinx kalmiæ.

was over for I took these within a few minutes of my arrival, and a cold thick fog came up over the fields just before I left them and it is uot unlikely that the insects felt it before I did.

For anyone fond of nature, it would not be easy to select a spot more interesting to spend an hour in, than that occupied by my milkweed patch—on its slight elevation, in the midst of hayfields, the sunset gradually fading away over the Maine Woods and the day-flying fauna disappearing to their resting places, to be replaced by a nocturnal fauna as invisible by day as the former is at night. The scent from the milkweed plant grows stronger as darkness sets in, the moths begin to flutter about, the whip-poor-will is heard on every side and the roar of the sea on the shore seems more soothing than by day.

We cannot all have the accompaniment of the ocean, but any entomologist who has not examined the milkweed blooms at dusk has a pleasure still to look forward to.

A COLLECTING TRIP IN SOUTH-WESTERN ONTARIO.

By E. M. Walker, Toronto.

During August, 1901, the writer had the good fortune to accompany Prof. John Macoun, Naturalist to the Geological Survey of Canada, on a collecting trip in the South-Western peninsula of Ontario.

Prof. Macoun's investigations occupied the whole summer, from the latter part of May until the beginning of September, and collections of plants were made at a great many localities, covering practically the whole dis rict.

The chief object which I had in view in making the trip was the collection of Orthoptera, as the region traversed was quite unexplored from this point of view. The time which I had at my disposal, however, was limited to the month of August, so that I was unable to visit localities enough to represent the entire district.

While most of my attention was given to the Orthoptera, I also collected a considerable number of Odonata and kept on the lookout for anything of special interest in the entomological or botanical line.

Our first stop was made at Leamington, a place not specially interesting in itself, but one from which several very profitable trips can be made. The chief of these is the trip to Point Pelee, the extreme end of which is some twelve miles distant from the town. It is a long sandy point, very narrow in its lower part, where it is largely covered with red cedar and juniper, but is somewhat wider in its upper part with sand dunes of some size on the west side, beyond which on the east are broad prairie-like flats of excellent wheat lands, formerly marshy. There are still marshes which will repay the collector in probably any branch of Insecta. The upper part of the point is beautifully wooded with magnificent walnuts, nettle-trees (*Celtis occidentalis*), basswood, cottonwood, etc., and a variety of oaks, with junipers in the more open places and near the beach ; and many southern plants and insects are found there. I spent a day on the Point, and saw a *Papilio Ajax*, several of *P. Cresphontes*, any number of *P. Troilus* and captured a beautiful specimen of *Limenitis Ursula*.

Along the roads leading from Leamington to the Point *Papilio troilus* and *asterias*, especially the former were present in astonishing numbers. The presence of the former is what one would expect from the large number of Sassafras trees in the locality.

The bordered skipper (*Ancyloxypha numitor)* was present in great numbers along every roadside ditch and many specimens of another southern skipper (*Pholisora Catullus)* were also seen. The tobacco-worm, *Phlegethontius Carolina* is common in this district on the leaves of the tobacco which is grown in large quantities and of good quality in this part of the province.

The Orthoptera were very interesting, the family *Locustidae* or green grasshoppers and katydids being abundantly represented in the large open marshes at the north end of the Point. In fact I found them to be very well represented everywhere throughout Southern Ontario, the group being on the whole a decidedly austral one. This fact will be appreciated when the number of species inhabiting Southern Ontario is compared with those of the Nipissing and Muskoka districts. I took about 21 species in southern Ontario, whereas in Muskoka there are but eight and in Nipissing probably not more than five, only one of which is truly characteristic of the north. Most of the 21 southern species are Ohio and Indiana forms, such as *Xiphidium Scudderi* and *nigropleurum*, *Orchelimum indianense*, *O. longipenne*, *Conocephalus nebrascensis*, etc.

One marsh, especially at Point Pelee, yielded a remarkable variety of forms within a comparatively small area. This was at the mouth of a small creek which emptied into the lake at the upper end of the Point. On either side of the creek was a growth of wild rice, so tall and vigorous that at a short distance it had much the appearance of a field of Indian corn, and beyond

this, where the ground was not quite so wet, was an extensive growth of rushes and sedge. It was in the sedge that the green grasshoppers were most abundant, but they were very difficult to capture since, when alarmed, most species of Locustidae, especially the smaller kinds, have the annoying habit of darting downwards into the sedge and then leaping rapidly from one stem to another until one has not the least idea where to look for them. Fortunately, however, most species are found in large numbers when their particular haunts are discovered.

In this marsh, and practically in one spot, I took no less than a dozen kinds of Locustidae alone, all but two of which are unrecorded from Canada. Of these, one of the most striking in appearance though the smallest in size, is *Xiphidium Scudderi*, a long-legged little hopper, brownish instead of the usual green color, with short wings, long antennae and an extraordinarily long straight oripositor, often twice as long as the body. *X. attenuatum*, of which I found a few specimens, seems to be merely a long-winged form of the same species. Another interesting addition to our fauna made at Point Pelee is *Scudderia Texensis*, a very large bright green form related to the well-known *S. curvicauda* but larger. It is one of the katydid tribe and has a wing expanse of fully three and three-quarters inches.

The most abundantly represented genus, however, was *Orchelimum*, six species being found. Now this is remarkable when it is remembered that from Toronto northward to Lake Superior only one species occurs and that a very common and widespread one, viz., *O. agile*. This, by the way, is the common meadow grasshopper, whose familiar song, the "jip, jip, jip, zee-e-e," is known to everyone.

The other families of Orthoptera did not yield so many new forms, but one of them taken in the same marsh as the one just described was wholly unexpected and has a very southern distribution. This is *Tryxalis brevicornis*, a slender green and brown Acridian, with a long conical head and short flattened antennae. Its distribution as hitherto known is from Indiana and Long Id. to Honduras and Brazil, its occurrence in Indiana having been considered as unusually far north. I got but two specimens, both males, in good condition.

Another trip which we took from Leamington was to Arner, a village a few miles west of Kingsville. There were large open marshes here also, but although apparently very similar to those of Point Pelee, both the flora and insect fauna were in many respects different, some species common at Arner being entirely absent from the Point and vice versa. For example, not a single specimen of *Paroxya floridana* was seen at Point Pelee though very common at Arner, and *Orchelimum Bruneri* was very common at Point Pelee, but none were seen at Arner. This was in fact the only locality visited during the present trip where the first named species was found. It is a pretty brightly colored grasshopper with blue hind tibiae and is characteristic of the Eastern States from southern New England and Indiana to Florida, not having been taken in Canada before.

Another very interesting form taken at Arner which must not be overlooked is *Atlanticus pachymerus*, belonging to the Decticinae, a group of Locustidae, characteristic of the western half of North America, Atlanticus being the only eastern genus. It is a large, clumsy, brown, cricket-like form, the female quite devoid of either tegmina or wings, though the male has retained the tegmina as organs of stridulation. The thorax is very large and shield-like, and this feature has given the insect the name of the shield-back grasshopper. It is found in ravines and wooded hill-sides, but I came across it only at Arner.

From Leamington we went to Sarnia but on the way we stopped for five hours at Chatham and went for a tramp along the Thames embankment. Here the flora was quite unique in character and of great luxuriance and vigor, the nettles and Jerusalem artichokes towering far above our heads. The Professor pointed out several prairie species there, not found elsewhere in the Province, and it is his belief that this section was once prairie. It certainly would appear so to

judge by the presence of these typically prairie plants and the general perfectly level appearance of the country.

At Sarnia there is a great deal to interest the entomologist and Prof. Macoun found a great number of plants not recorded from Canada, among which was a grass new to science. The most striking thing in the insect line was the abundance of *Papilio Cresphontes.* Any number could have been taken but I had no space in either my bottles or boxes for anything but Orthoptera and dragon-flies. Another interesting butterfly found here and both at Chatham and Leamington was *Pieris protodice.* At the two latter places it is the common white butterfly, *rapae* being only occasionally seen. At Sarnia both are common but *protodice* is much the more predominant, while further north only *rapae* is seen.

This re-appearance of *P. protodice* after its apparent replacement by *P. rapae* strikes one as being quite remarkable, and it seems to confirm Mr. Moffat's opinion, expressed in the Twenty-fifth Annual Report of the Entomological Society, p. 61. He refers to the rapidity with which this change was brought about and regards as very improbable the theory that the disappearance of *P. protodice* has resulted as a consequence of the struggle for existence and the survival of the fittest. Mr. Moffat's idea is, briefly, that the two forms are races of one species, which on being brought together have interbred ; the result being the persistence of the characteristics of the stronger race, *rapae*, and the suppression of those of the weaker, *protodice*. But although *protodice* is weaker, its characters are such as have resulted from its particular environment, such as the climatic conditions and other external influences under which it lives ; and hence these characters must inevitably reappear in time as these same forces are still at work. Mr. Moffat also noted the recent capture of a few specimens of *protodice* in the vicinity of London and expressed the opinion that it would be common again in time. That it is becoming so seems to be evident from what I have observed in Southern Ontario, whatever the explanation may be.

Of Orthoptera and Odonata a number of interesting things were taken. Most of these were captured in a large open stretch of meadow-land, which extends along the St. Clair River between the town and the southernmost point of Lake Huron, where the St. Clair River leaves it. This stretch of country is under water during the spring and early summer but was quite dry when I saw it in August, and portions of it were gorgeous with the purple spikes of *Liatris spicata*, the dense button-snakeroot, making one of the most brilliant floral displays I have ever seen. Several interesting things were found here, notably *Orphulella pelidna* and *Conocephalus nebrascensis* neither of which had been taken before in Canada, nor were they met with again during our trip. I also took specimens of the two beautiful dragonflies, *Celithemis eponina* and *C. elisa*, the former flying about for the most part near the river where the ground was still wet, the latter being commoner further inland.

Separating this stretch of meadow-land from the wide beach of the lake is a high ridge of sand dunes wooded mainly with oak, while west of the town of Sarnia is the cemetery, which is also sandy, being much like High Park in character. Both of these localities, especially the latter, will richly repay the efforts of the entomologist.

Before leaving Sarnia finally the Professor and I crossed the river to Port Huron and thence took the electric railway down the river to Algonac, where we hired an Indian boy to ferry us across to Walpole Id. This is a Canadian island of considerable size and has been set apart as an Indian Reserve. It is an excellent collecting-ground being for the most part occupied by woods or marshes. Here I saw a great many *Papilio Cresphontes*, *Limenitis disippus*, *Pieris protodice* and other butterflies sipping the moisture from the ground near the water's edge. The marshes yielded numbers of *Orchelimum longipenne*, a green grasshopper only one specimen of which was seen elsewhere, namely at Point Pelee. I was indeed much struck throughout the trip by the fact that these open marshes, though often apparently of the same character and not far distant from one another, may support faunas which are by no means identical, some species

found not at all or very sparingly in one marsh being common in another and vice versa. I was unable to discover the reason of this but I imagine that on closer examination the conditions would prove to be more different than was apparent at first sight, or that many of the insects found therein are very local.

From Sarnia we went by steamboat to Goderich, which town we did not find very interesting from a natural history standpoint, the country being entirely of a clayey character; so we contented ourselves with a single day's trip which was very unprofitable entomologically, the only thing of special interest which was taken being a specimen of *Cychrus Lecontei*, a rather rare carabid beetle.

Our next stopping place was Southamptom, a locality which amply repaid both of us and one where a great variety of country is to be found close at hand. The shore, which at Goderich is a steep clay bank about 200 feet high, is again low and sandy, a magnificent beach which strongly recalled the sea shore extending for some miles on either side of the town.

The forest growth here is quite boreal in character; white spruce, white cedar and juniper (*Juniperus communis* and *J. sabina* var *procumbens*) being the prevailing trees on the sand dunes which form a ridge behind the beach. Back of this ridge a short distance south of the town is an extensive swamp, in which the orthopterous fauna was also of northern type.

The most interesting capture made here however was an Oedipodine, a new species of *Trimerotropis*, which was found flying about on the beach, having essentially the same habits as *T. maritima*, which is abundant on the beaches of the great lakes further south, extending a little above Sarnia and is also found on the North Atlantic seaboard. As soon as I observed this extensive beach at Southampton I thought of the probability that either *T. maritima* would be found there, and if so at a much more northern locality than hitherto reported, or that some other species would take its place. After considerabie search the latter proved to be the case and the species which replaced *maritima*, though closely allied, differs from that species not only in structure and markings but also markedly in the character of the stridulation.

I did not find much else of particular interest at Southampton, but this was doubtless because I paid small attention to anything but Orthoptera and Odonata; but on general principles I should highly recommend the locality to entomologists who are studying the Ontario species of any group of insects, because I believe there are very few, if any, places of exactly the same character in the Province. I doubt if a wide and extensive beach is to be found anywhere north of Southampton, as the eastern shore of Lake Huron north of a point about ten miles above Southampton is, as far as I know, continuously rocky.

After spending a few days collecting at Southampton we hired a good sized fishing boat and spent a most delightful week on the lake between Southampton and a small town called Tobermory, a few miles from Cape Hurd on the Georgian Bay side. Our party included the Professor's assistant and two fishermen, besides ourselves, and the object we had in view was the examination of the east shore of the lake as far as the Cape and also a few of the islands.

We cooked our meals and slept on board, though at night we of course always put into some harbour, of which many fine examples are to be seen. At Tobermory, for instance, there is a beautiful harbour, about half a mile long, the shore of which at the town is perfectly vertical to a depth of about thirty feet below the surface and some three or four above, so that no wharf of any kind is necessary and large vessels can come up close to the shore.

A decidedly northern flora and fauna is to be met with in this peninsula, but Prof. Macoun says that half a mile or so inland these conditions give place to the ordinary hardwood forests, such as would be met with in any part of Ontario at that latitude. This northern climate is mainly due to its proximity to the cold lake, but another factor also contributes in some parts of the shore rendering the climatic conditions boreal in character. This occurs at certain points where the limestone is very low and flat and only just a little above the level of the lake. The

snow and ice in these places remain in the woods sometimes as late as June and in early summer the place is still very wet. Later on, however, it dries up and the rock is exposed or is very near the surface almost everywhere.

The soil on this peninsula is very scanty and on the low places near the shore the plants and insects are very few in number of species. The Professor said that the flora resembled that of Anticosti, but I did not notice much that was remarkable about the insects. A peculiar little Catocala was perhaps the most interesting thing taken. It is closely allied to *C. antinympha*, if, indeed, it be not a variety of that species, from which it differs in the much lighter and more distinctly marked fore wings.

Among the Orthoptera *Podisma variegata*, two long-winged males of *Melanoplus fasciatus*, a form of very rare occurrence, *M. islandicus* and *Scudderia pistillata* are perhaps noteworthy. The first named is a very interesting Acridian of the group Melanopli and belongs to an alpine and northern genus, being the only American species which is not alpine. Like many alpine insects it is perfectly apterous and is closely allied to *P. glacialis* of the White Mountains and Northern Ontario. I have also taken it at Lake Simcoe. It inhabits cool swamps, especially peat bogs. *Scudderia pistillata*, which was found not uncommonly on the peninsula and at Southampton, is our one characteristically northern Locustid. It was exceedingly abundant on one of the small islands.

Before leaving the subject of this locality there is one fact concerning it which is worthy of remark, and this, though a botanical one, would probably influence the insects too. Many flowers common to this region and southern Ontario (notably Point Pelee and Sarnia) were in bloom or going to seed at a time when the same plants in the south were in bud or only just beginning to bloom. Now, this state of affairs at first seems very extraordinary when we remember that the snow remains so late here and the climate is decidedly colder than in the south. The explanation lies in the fact that the plants are growing over limestone, which absorbs more heat than any other rock, and much more than the ordinary soil.

After our return to Southampton we spent a few more days there and then drove to Owen Sound, where the limestone forms a bold escarpment overlooking the city and offers new conditions to the collector of both plants and insects. Deep crevices extend far into the rock and from above one can look down these, often forty feet. Some rare ferns are found here, but I got but little that was of interest to the entomologist, though I fancy a coleopterist could have taken plenty of interesting things.

Another locality at Owen Sound which the collector should not overlook is the Patterson House Park, the property of Mr. Matthews, the proprietor of the Patterson House, which is one of the chief hotels at Owen Sound. The park is several miles long and follows a ravine, along the bottom of which a small creek runs. The woods are in a primitive condition and some of the trees, notably the cedars, are of enormous size. The chief thing of interest that I found there were specimens of *Calopteryx maculata*, a beautiful dragon-fly which, though very common in June, usually disappears late in July, my specimens having been taken on the last day of August, an unusually late date. The luxuriance and beauty of this ravine would, I am sure, make it an admirable collecting ground.

Owen Sound was the last spot visited by the writer before returning to Toronto, so that the trip was practically taken up in following the shores of Lake Erie and Huron from Point Pelee to Owen Sound.

In conclusion I should like to emphasize one point in connection with the collection of specimens on a trip such as the one which has been the subject of this sketch. Most collectors, as far as I have observed, look for those species only which are wanting in their collections or which are rare or otherwise interesting. This is a great mistake. Every species in the group which the collector is studying should be noted down in a book kept for that purpose, and if

the collector is not absolutely certain of the identity of the species, specimens should be taken. It is better, if possible, to take specimens of every species from each locality visited, though, of course, this is unnecessary in the case of some very common and easily recognized species. It is only in this way that an accurate idea can be obtained of the distribution of the species in a given locality, and the value of an accurate knowledge of zoological distribution can scarcely be overestimated.

CRICKETS.

By Rev. Thomas W. Fyles, Levis, Quebec.

There are certain things which greatly excite the wonder of the Old Country visitor to Canada :—the piping of the tree-frogs in the Spring ; the flash of the fire flies in the Summer ; and the sibillations of Orthopterous insects in the Fall. Other sights and sounds may be new to him, but these intrude themselves so persistently upon his attention—there is so much of them in every case—that they never fail to make a deep impression upon his mind. When he walks out in a calm night of August or September, his ears are greeted with such a tweaking of banjos from the black-crickets, that he almost expects these *nigger* performers to start up a plantation song for his amusement. He thinks to himself, (we may suppose) that the solo of the "Cricket on the hearth" of English writers is a very poor performance, compared with this chorus of the Canadian crickets in the field.

The name cricket is one of those imitative, onomatopæic words, such as "wake-up," "pee-wit," "aye-aye," etc.

In my first year in the country-parts of Canada—long, long ago now—I was riding home at midnight from a visit to sick friend. My road was a lonely one, leading through the valleys of the Brome Mountains. I amused myself by putting together the following lines, suggested by the surroundings :—

On either side the road are rugged hills,
   And leafy branches mingle overhead ;
   O'er all, heaven's vast unclouded vault is spread,
Which the round moon with silver radiance fills,
The Gryllus chirrups ; the Œcanthus shrills—
   Ten-thousand quavering notes around are blent—
   The shaken air itself seems sibilant—
From every bush the constant burden trills.
It is to us as an outlandish tongue—
   We hear it, and pass on, acquiring nought ;
   We know not with what meanings it is fraught,
What triumphs, hopes and fears in it are sung.
To Him, who plann'd the Universe, alone
Ascends the import of each several tone.

But things that make so much noise in the world, as the crickets make, are deserving of more than passing attention ; and we may well spend a short time in looking into their structure, their habits and their history.

The crickets belong to the Orthoptera—Saltatoria or leaping straight-winged insects.

The first in order of the Quebec species is,—

ŒCANTHUS NIVEUS, DEGEER. (THE TREE CRICKET.)

This is an elegant creature well deserving of notice ; it is a little fairy robed in white—a dweller in the blossoms.

The male Œcanthus (Fig. 24, page 48) has transparent wing-covers rounded at the extremity and strongly veined. It is the combined friction and vibration of these veined wings that produces the notes with which it serenades its mistress.

The female (Fig. 25) has narrower wing-covers less strongly marked. Like a modest damsel she holds her peace.

These insects have ample and delicate hind wings, and long filiform antennæ. Their hindmost feet have four joints each—one more than we find in those of other crickets.

The female has a short, stout ovipositor with which it pierces the twigs of fruit trees, raspberry-canes, etc., and deposits her eggs in the wounds (Fig. 26). The young larvæ appear at midsummer, and feed upon aphides and small fruit.

GRYLLOTALPA BOREALIS, BURMEISTER. (THE MOLE CRICKET.)

The prince of our Canadian crickets is the Mole Cricket. It is a rare insect with us ; but it is common in some parts of the United States. In places where it abounds it has been found mischievous. It burrows in the gardens, and eats the roots of newly planted vegetables. 1,400 full grown mole crickets were once found on a surface of two fifths of an acre that had been planted with cabbages.*

Fig. 50. Mole Cricket.

Its disproportionately large front legs, its abbreviated wing covers, its pleated wings extending to points beyond these, and the long tags with which the body terminates give the mole cricket a strangely grotesque appearance.

The members first mentioned seemingly terminate in gauntleted hands with the fingers extended. But these seeming terminations are neither hands nor feet–they are the tibiæ or shanks of the front legs of the insect. The small feet are attached to the outside of them. With these shanks the cricket delves, and tunnels, and scoops out the chamber destined to be the receptacle of its eggs When not in use these tibiæ are drawn back and protected by the femora.

The length of the mole-cricket is about an inch and a quarter. Its colour is light bay or fawn.†

Much of our information upon the habits of the mole-cricket is derived from the Rev. Gilbert White who wrote more than a hundred and twenty years ago. In his delightful "Natural History of Selborne", he tells us that a gardener mowing beside a canal, struck his scythe too deep, and pared away a sod, exposing a mole cricket's nest and the approaches to it. "The nest was the size of a moderate snuff-box, Within the secret nursery were deposited near a hundred eggs of a dirty yellow colour and enveloped in a tough skin."

In Rennie's "Insect Architecture", enlarged by Rev. J. G. Wood (Bell and Dalby, London, 1869.), p. 266, a cut of the mole-cricket's nest and eggs is given. From this illustration we should infer that the "tough skin" is not a sack enclosing the batch of eggs, but the skin of the eggs individually, for the eggs are represented as lying in an open pile on the floor of the chamber.

*Dr. Fletcher in 22nd Ann. Rep. Ent. Soc. of Ont., p. 89.

†Harris's Insects injurious to Vegetation, p. 149.

The English mole-cricket is *Gryllotalpa vulgaris* Latr. It is a larger insect than *G. borealis*.

Dr. Lintner in his "Sixth Report on the Insects of the State of New York," says of *G. borealis* ;—" Our-mole cricket lives in the ground, usually in moist earth—often on the sides of ponds or small streams, where it burrows into the moist ground at a depth of from six to eight inches, by means of its front pair of legs which are admirably constructed for digging. Its eggs are laid in these galleries, in a tough sack, to the number of from two to three hundred, within the chamber scooped out for the purpose." Dr. Lintner does not say that he writes this from his own observation ; and we are left somewhat in doubt as to whether the habits of our mole-cricket differ from those of the European, or whether Dr. Lintner's words, " in a tough sack " are a mistaken rendering of White's " enveloped in a tough skin ", or again, whether Rennie or Wood drew merely from imagination. It would be well if some Southern entomologist would clear up this matter.

G. borealis is said to hibernate in the larval condition. The perfect insect appears in May or June. The female then lays her eggs which hatch in one month. She guards her young brood until they come to the second moult,for they have many enemies,among which may be reckoned various kinds of ground beetles.

In some parts of England the mole-cricket is called the " Eve-churr ", because of its peculiar note ; and Professor Scudder, in an article contributed to the 23rd Report of the Ent. Soc. of Ont., p. 63, compares the call of *G. borealis* to " a guttural sort of sound like grü or green, repeated in a trill indefinitely."

The Field Crickets.

But the crickets with which we are most familiar are the common field-crickets. Of these we have, in the Province of Quebec, at least three easily distinguishable kinds, viz :—

Gryllus neglectus, Scudder.

Gryllus niger, Harris.

Nemobius vittatus, Harris.

The first-named is about two-thirds of an inch long, black, with a brown line along the deflexed border of each wing-cover.

G. niger is a smaller kind. It measures only about half an inch in length. It is jet black. The males are comical little fellows.

Nemobius vittatus is the smallest of the three. It measures only about four-tenths of an inch in length. It is of a dusky brown colour and has three black lines over the head, and a black line along each wing-cover.

Insects of these three kinds are found in great numbers around Quebec. Their notes are produced by stridulation. The wing-covers are slightly raised and the projecting veins of one are briskly grated upon those of the other. The males only produce the sound.

The females lay their eggs in the ground by means of their long ovipositors.

Harris thus speaks of the injuries done by crickets:—"Where crickets abound they do great injury to vegetation eating the most tender parts of plants, and even devouring roots and fruits whenever they can get them. Melons, squashes, and even potatoes are often eaten by them, and the quantity of grass that they destroy must be great, from the immense numbers of these insects which are sometimes seen in our meadows and fields." (Ins. inj. to Veg., p. 151).

The crickets, especially *G. neglectus*, are often troubled with that strange parasite the Hair-snake. The Vice-President of the Quebec branch of our Society observed five of these creatures wriggle away from a cricket that a gentleman had struck down with his walking-stick—*they did not stay upon the order of their going*. The puzzle is, how did they find their way in ? This is a greater puzzle than that which perplexed King George III. The monarch—so the story runs—one day entered a farm house, where he was at the time unknown. The owner and his family

were just sitting down to dinner, and hospitably invited the respectable old gentleman, who had walked in, to partake of the meal. The King graciously accepted the invitation. Among the dishes served was one of boiled apple-dumplings. In due course the King took one of these upon his plate. He examined it with interest. He could see no marks of stitches, nor other sign of a junction in the crust ; and, mentally giving up the riddle, he exclaimed "However did the apple get inside the dumpling ?"

The hair-snake is certainly found inside the cricket curled round, like the spring of a bird-trap, under the skin of the insect. There it thrives, imbibing the juices of its host ; but how it got there is as yet a mystery.

I have mentioned the ground beetles that feed upon the eggs and young of the crickets. Our largest Quebec species is the Copper-spot Ground-beetle, *Calosoma calidum* Fab. (Fig. 51). The beautiful metallic spots on the elytra of this handsome insect make it easy of recognition. We have other fine beetles of predaceous habits. Amongst them is *Carabus mœander* Fisch., a brown beetle of elegant shape, and with elytra finely sculptured with raised lines and rows of oblong spots. This insect is not uncommon at Quebec, but is rare in other parts of the province. *Cychrus viduus* Dej., is another handsome beetle, purple in colour, with striated elytra, and a large cordate abdomen. This last named species is said to regard slugs and land-snails as high-class food. But,—

Fig. 51. The Copper spot Ground-beetle.

"*Revenons à nos moutons.*"

GRYLLUS DOMESTICUS, LINN (the Domestic Cricket).

During the autumn months of this year a cricket enlivened my house with its nightly serenade. Its place of abcde was amid the inequalities between the mantel and the brick-work of the kitchen fire-place ; and its favourite position was to stand head downwards, with so much of its body protruded from beneath the mantel as would allow of the free play of its wing-covers. With these appendages constantly vibrating, and with its long antennæ moving backwards and forwards, as if to catch the slightest pulsations in the air that might tell of danger, it would remain for hours. It did not seem to be afraid of light. I could approach warily, lamp in hand, within a yard of it, and watch its motions ; but on the slightest aggressive movement it would dart backward to its retreat. It was about eight lines in length of body, of an ochreous colour with brown and white markings. The veins of the wing covers were brown. The antennæ, palpi, tarsi and abdominal appendages were of a dull yellow. The last named were fringed.

The call of the insect was kept up till the middle of October, when it gradually became fainter and at length ceased.

CEUTOPHILUS MACULATUS, DE GEER (the Wingless Cricket).

A few seasons ago I had the opportunity of watching a wingless cricket as it sent forth its shrill "chirrup." Its hindmost pair of legs were moved up and down rapidly and their spin · shanks brought to bear upon the edges of the abdominal plates. The combined friction and vibration produced the notes. The movement reminded me of that of the "up-and-down saw" in an old fashioned saw-mill.

The insect is the *Ceutophilus maculatus* of De Geer, and comes in the Locustaridæ ; but, as Harris calls it "the spotted, wingless cricket," and its call is a cricket's call, it seems fitting to speak of it here.

The creature can be easily recognized by its rounded back, its brown colour mottled or potted with yellow, and its lack of alar appendages.

It is from 6 to 8 lines in length of body, and it has remarkably long antennæ and hind limbs.

There are other creatures that help to swell the concert that in the autumn evenings so deeply impresses us with the sense of the abundance of insect life ; but those we have spoken of—with their violins, banjos, and tambours—are the strength of the musical company.

Erratum.

The Rev. Dr. Fyles drew attention to a printer's error on page 54 of the Thirty-first Annual Report, line 17 from the bottom, where the word "stainy" is printed in place of *satiny*.

NATURE STUDY LESSONS ON MOSQUITOES.

By Prof. W. Lochhead, Ontario Agricultural College, Guelph.

It is unnecessary to state that mosquitoes are interesting for more reasons than the purely scientific. Perhaps no other insect is so well known throughout the wide world, for savage as well as civilized man suffers from its bites. It tortures the Eskimo as much as it does the African or Venezuelan, and makes life almost unbearable at certain stages in the high Arctic regions.

The object of these lessons, however, is more to learn about its habits and life-history than to give information regarding the effects of its bite ; although this latter phase is being studied very closely by scientific men at the present time, for it has been proved that certain species of mosquitoes are able to inoculate man with the organisms of malaria.

The best time to study the life-history of the mosquito is in the summer when the "wrigglers" are abundant in stagnant bodies of water. If a large glass jar be nearly filled with water from pools in marshy places, from ditches where leaves have accumulated, or from exposed rain barrels, a supply of mosquitoes in different stages of development can usually be obtained, aud kept conveniently under observation. It would be well to cover the jar with a net of muslin to prevent the escape of the winged mosquitoes as they emerge.

The Eggs. Sometimes curious boat-shaped masses of eggs (Fig 52*a*) may be seen floating on some stagnant water. These should be secured, and put in the glass jar. An egg-mass consists of 200 or 300 spindle-shaped eggs, glued together. It readily rises to the surface if pushed below, and is none the worse of the ducking. It is probable that very few persons have ever seen the female in the act of laying her eggs, but it is supposed that the operation is performed in the early morning hours just before sunrise. The eggs hatch in about twenty-four hours after they are laid. The young "wrigglers," or larvae, make their escape from the underside of the eggs, by the opening of a lid.

The Wrigglers or Larvae. A careful watch over the inhabitants of the glass-jar will show how the wrigglers act. If some of them can be found at rest at the surface, it will be seen that they float with the head downwards, and the end of the body at the surface. (Fig. 52*c*).

At the mouth two tufts of bristles are in ceaseless vibration, and produce a continuous current of water, in which minute creatures are brought within reach as food.

The upper end apparently divides into two branches ; one branch rises to the surface, the other branch, the true hind segment, and the larger branch, serves as a rudder. When a wriggler is disturbed it wriggles away, using the rudder to direct its course. It will be noticed, moreover, that the wrigglers make greater efforts in rising to the surface, than in sinking through the water. This shows that their bodies are heavier than water, and they must have some means of keeping themselves at the surface.

The branch (Fig. 52*c*) which rises to the surface is in reality the breathing tube of the wriggler. The upper end consists of a five-rayed rosette, which is spread out on the surface of

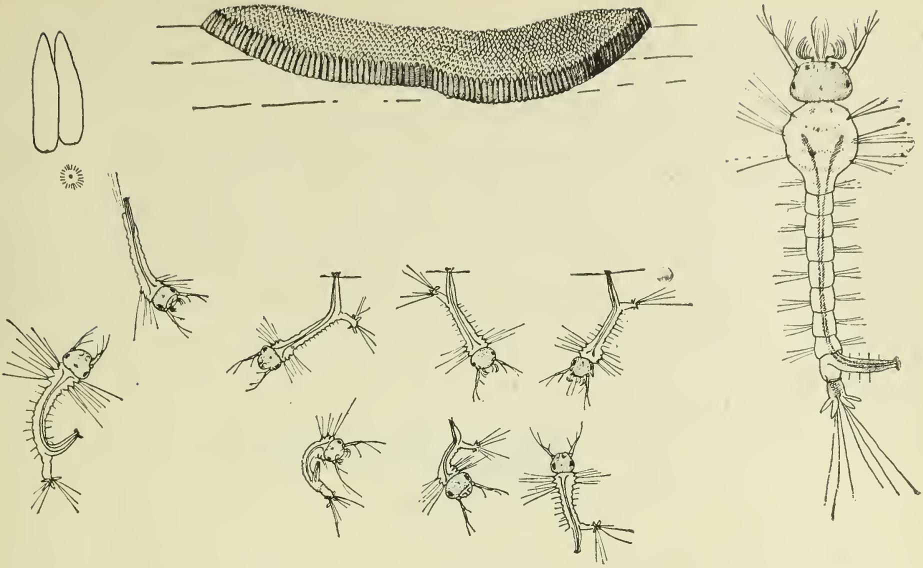


FIG. 52.—*Culex pungens:* Egg mass, *a*, with englarged eggs at left, *b*, and young larvæ below, *c*—enlarged. (From Howard, U. S. Department of Agriculture.)

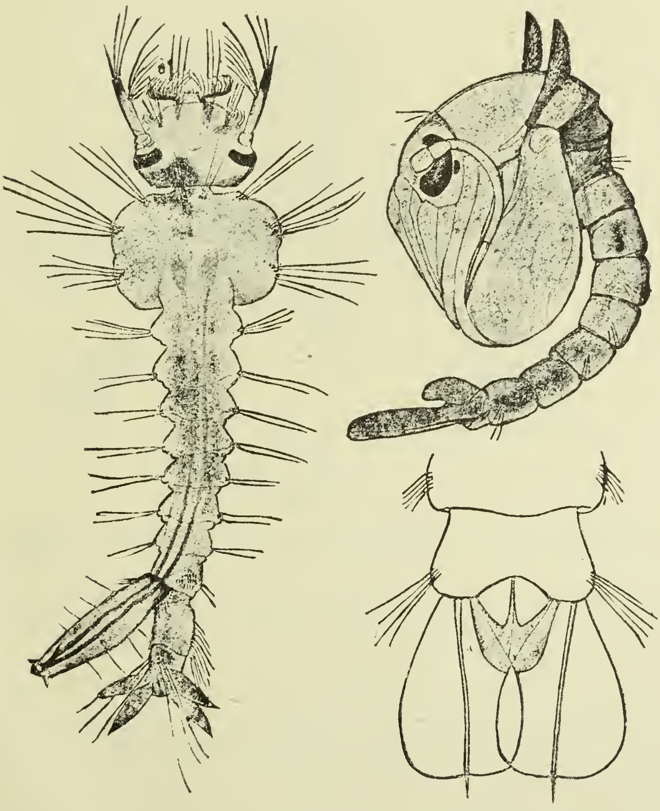


FIG. 53.—*Culex pungens:* Full grown larva at left, *a*, pupa at right, *b*—enlarged appendages of tail of pupa, *c*. (From Howard, U. S. Department of Agriculture.)

water. The tension of the surface film buoys up the rosette, and hence the wriggler itself. Through this breathing tube the insect, gets its supply of air. [Find out how long a wriggler can remain under water without coming to the surface for air.]

In nine or ten days, the wriggler assumes another shape—known as the *pupa*. [Determine how often the wriggler moults in this time.]

The Pupa. They are considerably different in appearance from the true wrigglers. Their head-end is much enlarged (Fig. 53) and the insect is somewhat club-shaped. There is a difference also in their appearance when at rest. The head-end is at the surface, and the supply of air is taken in by two breathing tubes attached to the upper surface of the thorax portion of the enlarged end. Unlike most pupæ, the pupæ of the mosquitoes are active creatures, wriggling about in the water.

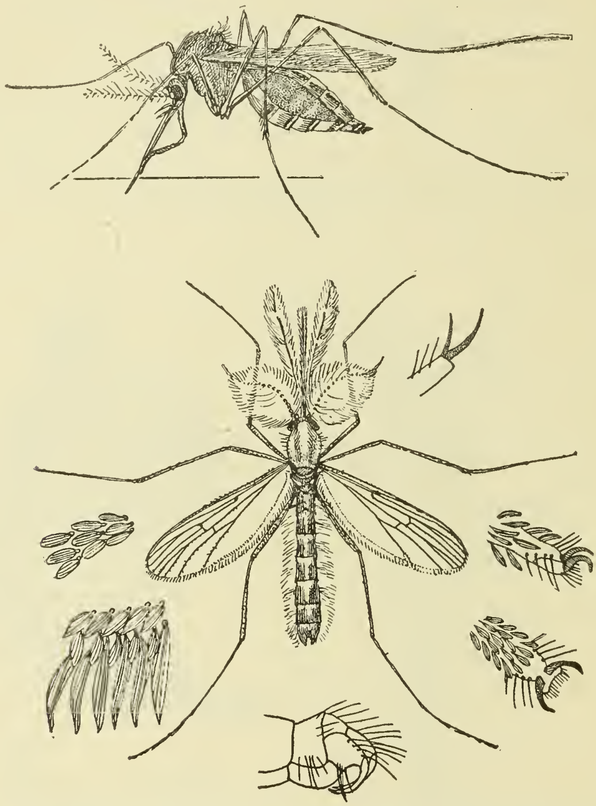


Fig. 54.—*Culex pungens*: Female above, male below,—enlarged. Scales on margin of wing; scales along veins of wing. (From Howard, U. S. Department of Agriculture.)

When a pupa-wriggler is disturbed, it becomes apparent that it makes greater exertions sinking than it does in rising. Its body, then, is lighter than water, and rests naturally at the surface without the aid of a special float.

During this stage, the mosquito develops the wings, legs, and the peculiar stinging mouth-parts, which are of such value to it in the adult stage. The rudiments of the wings and legs may be seen through the pupa-case, if a strong magnifying glass be used. In two or three days, the adult winged mosquito escapes from the pupa-case. (Fig. 54.)

The Adult Mosquitoes. When the time arrives for the emergence of the winged mosquito. the pupa-skin splits along the back, and the insect gradually raises itself on its long spindly egs using the old pupa-skin as a raft. It is nearly bent double as it pulls its wings out, but soon

these become filled, and it is ready to escape. If the wings should get wet during this delicate operation on the unsteady raft, it is more than likely that the poor mosquito perishes. A quiet body of water, therefore, is necessary for the safe emergence of mosquitoes in large numbers.

Male and Female Mosquitoes. The male mosquitoes are readily distinguished from the female by the long-feathered antennæ. The males neither sing nor bite, and if they feed at all it is on the juices and nectar of plants. It is quite probable that the normal food of these insects is the juices of plants, but it is also quite certain that the females delight in the warm blood of animals, including man.

The Wings. Mosquitoes have but one pair of wings. The margins of the wings are fringed with hairs, and the veins with minute scales. The buzz-sound of the mosquito is made by the rapid vibration of the wings, about 3000 in a minute, and by the air passing over little drums at the openings of the air tubes of the sides of the body. The hind wings are represented by a pair of stalked knots, called "balancers."

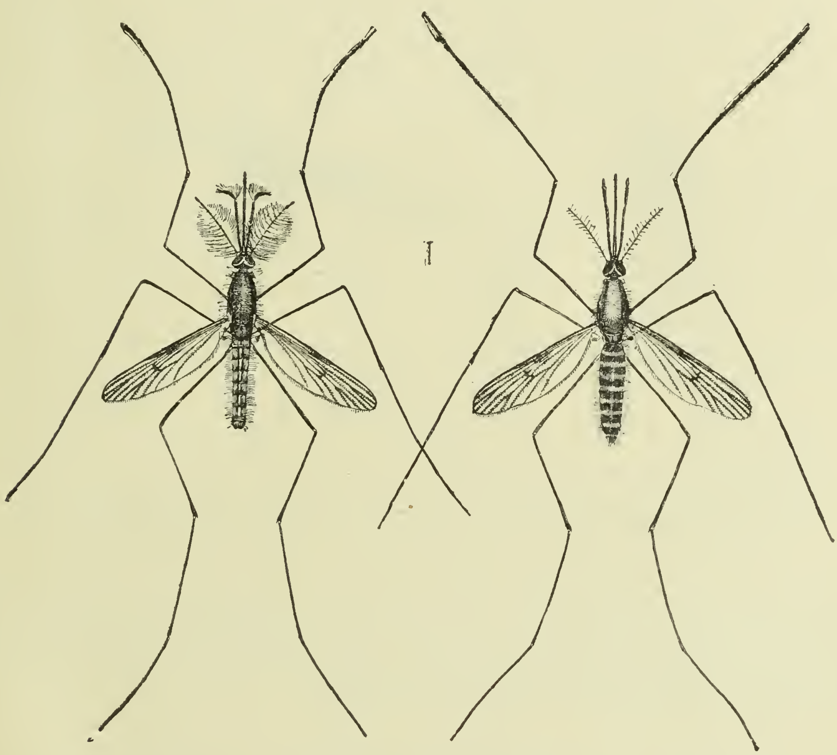


Fig. 55.—*Anopheles quadrimaculatus:* Adult; male at left, female at right—enlarged, (From Howard, U. S. Department of Agriculture.)

The Mouth Parts. These are to many persons the most interesting portion of the anatomy of the mosquito. The mouth-parts of the males are simpler than those of the female, and consist of but three parts, the sucking proboscis and the two palpi, one on either side of the proboscis or sucking-tube.

The females have a long slender upper lip, five slender lances, and a large proboscis with two short palpi (Fig. 55). When a female mosquito alights on the skin, she pierces it with the

"bill" composed of the upper lip and the five slender lances, and the blood is drawn up through the proboscis into the stomach.

Kinds of Mosquitoes. There are several genera of Mosquitoes, two of which are common, viz., *Culex* and *Anopheles.* The former, however, is by far more abundant, and the species *pungens* is the *Common Mosquito.*

Anopheles is important as it is the agent in the inoculation of the human body by malaria. The female Anopheles may be distinguished readily from the female Culex by the length of the palpi on each side of the proboscis. In the former the palpi are almost as long as the proboscis, while in the latter they are quite short. (Fig. 55.)

The resting position of mosquitoes is an interesting study, which may be carried on both summer and winter. In winter the adults cling to the ceilings of attics and basements. [What is the characteristic resting attitude of Culex on the ceiling and the vertical wall?] (Fig. 56.)

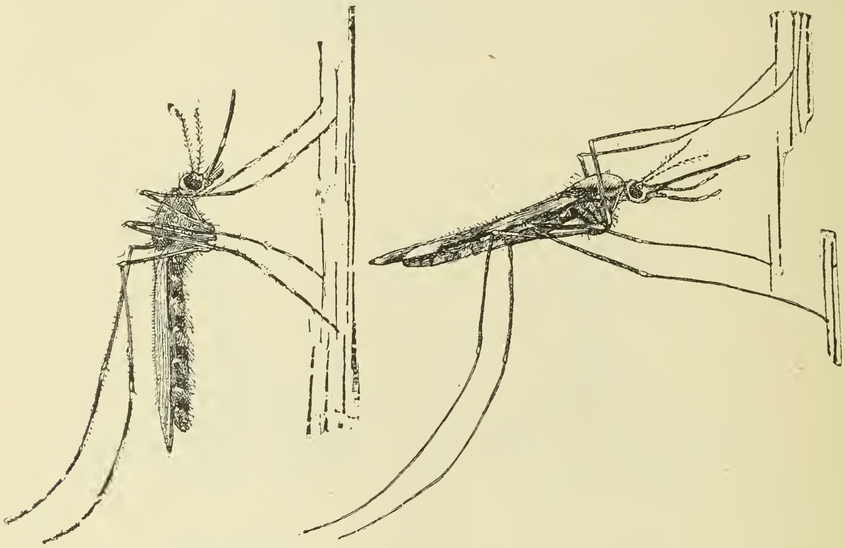


Fig. 56.—Resting positions of Culex (at left) and Anopheles (at right), enlarged (redrawn from a rough sketch published in the British Medical Journal. (From U. S. Department of Agriculture.)

How to rid a locality of Mosquitoes. Dr. Howard, of Washington, mentions three methods: 1. "By the drainage of the swamps or pools in which the mosquitoes breed." 2. "By the use of kerosene on the surface of the waters in which they breed." 3. "By the introduction of fish into fishless ponds so that they may eat the wrigglers."

Practical Exercises.

1. How far do mosquitoes fly from their breeding places?

2. Collect a large number of mosquitoes during the summer, and determine, 1. the number of males, 2. the number belonging each to Culex and to Anopheles.

3. The effect of the use of Kerosene on the breeding places of mosquitoes (use 1 oz. for every 15 sq. ft. of surface).

4. Full-study of life-history of Culex.

ENTOMOLOGICAL RECORD, 1901.

By Dr. James Fletcher, Ottawa.

Canadian students of Entomology, in the past, have had many obstacles to overcome before they could advance sufficiently in their studies to obtain that encouragement which is necessary to incite continued effort. Congenial companionship is undoubtedly the greatest and most useful help that any student can be blessed with in any line of research. It is manifestly of great advantage to know who is working at the same studies as ourselves and what others are doing, so as to correspond, compare notes and learn as soon as possible all that is to be known about any subject in which there is a mutual interest. We all know how the accidental capture of a rarity, or a chance incident, may direct our particular attention to some class of insects or some entomological problem which but for this accident might never have come before us.

Having for many years felt the want of this information, it has occurred to me that if there were published every year in the Annual Report a record of the important entomological events of the year, it would be of considerable use to every one interested in Canadian entomology. The plan of this Entomological Record may well, I think, be discussed by the members, and I shall be very glad to receive suggestions as to the most useful way of preparing it in future. The kind of information which it seems to the writer would be of use, will fall under the following heads :— (1) A record of special rarities taken by collectors, with the various localities and dates, which for ease of reference should be arranged under their natural orders and in the sequence of some recognised check list. (2) The names of specialists who have devoted particular attention to some order, genus, species, or phase of entomological study. (3) The names of any books of note affecting entomology, or connected with any branch of it, which may have been published during the year.

It is not proposed to include in this record, except perhaps in an incidental manner, facts connected with Practical Entomology. This subject will be fully treated of in "Notes of the Year" and other papers included in the Report.

The compilation and preparation of this Record need not always be done by the same person. I merely on this occasion submit a short outline or scheme, as a beginning, and, if my opinion as to its value is correct, I feel sure that year by year it will be improved in form. As soon as collectors and workers in entomology know that this will be a regular annual record, they will themselves send in notes of their work and requests for information, which will make it continuously more and more useful ; indeed it will be better, that this record should not be always prepared by the same person when the final form in which it should be drawn up, has been decided upon, and I would suggest that at each annual meeting the council should request someone to undertake the work for the ensuing year, and then publish their choice, with the address of the compiler, in the "Canadian Entomologist" for January each year, so that collectors may know to whom records should be sent. These records of captures, or requests for information, should be sent in from time to time, and should not be held over until the end of the year, or there is great danger of their being forgotten.

Needless to say, every care must be taken that the identification of all species mentioned should be as accurate as possible, and doubtless considerable correspondence may be required and in some instances specimens may have to be examined ; all this takes time, and will show how inconvenience may arise from records being sent in at a late date before the annual meeting.

In the meantime I shall be glad to receive notes on the above mentioned subjects, or advice as to improvements for the Record of 1902. The present article is merely suggestive—a beginning—and may be changed and improved to an unlimited degree.

The Season of 1901.

The season of 1901 in almost all parts of Canada has been characterised as "poor" by nearly all collectors heard from. Of those who have favoured me with notes, there are only two who have made satisfying collections, either as to species or as to numbers of specimens, viz. Mr. A. F. Winn, of Montreal, Que., and Mr. J. D. Evans, at Trenton, Ont. Such reports as "The poorest year I have ever known," "Remarkable for the absence of good species", "I never took so few good things", "Insects of all kinds scarce", etc., are almost universal. The only exceptions to this general statement in the reports received, were with regard to the unusual abundance in the West of *Pyrameis cardui* and *P. atalanta* and through the whole of Canada of *Pieris rapæ.* In all parts of Ontario, the noticeable insect of the season was the Birch-Tree Skeletonizer (*Bucculatrix canadensisella*). In Manitoba and the North-west Territories the moths of *Noctua clandestina* were found during July in myriads inside houses, to which they had doubtless been attracted by lights.

Literature.

Bibliographical notes on entomology appear regularly in all entomological journals and scientific magazines, such as "The Canadian Entomologist," "The Ottawa Naturalist," "Entomological News," "The American Naturalist," "Science," etc. These are all indispensable to the working entomologist.

Howard (L. O.)—"The Insect Book." An event of very great importance as affecting the whole subject of entomology is the recent publication of Dr. Howard's "Insect Book." Up to the present time, the one great obstacle in the way of lovers of natural history devoting their attention to the study of insects, was the fact that there was no single elementary work of moderate price, which would enable a beginner to identify and classify his captures. This want has been to a large measure supplied by Dr. Howard, with his most useful work. Copiously illustrated and written in untechnical language, it has already commended itself to a great many beginners, especially boys and girls, and will I feel confident, together with Dr. Holland's beautiful "Butterfly Book," do more to attract students to entomology as a recreation and study, than all the works which have preceded it. Beginners have now a starting point from which they can easily make an appreciable advance towards a knowledge of most of our common forms of insect life. The beetles and moths are now the only insects requiring treatment in the same manner, and it is to be sincerely hoped that before long this lack will also be supplied. Some deficiencies of minor importance, in the Insect Book, due to hurried publication, will doubtless disappear in the next edition.

Important monographic works will be dealt with under the Orders of insects to which they refer. Mention, however, may be made here of the splendid report by Prof. J. G. Needham, of Lake Forest University, Illinois, on the "Aquatic Insects of the Adirondacks," lately issued by Dr. E. P. Felt, State Entomologist of New York, a charming report of excellent and original work in an almost unworked field, and one which is very suggestive as to desiderata, with regard to which facts may be supplied by workers in all parts of the country. A valuable feature of this work, as in the Insect Book, is the number of suggestions which are made as to useful lines of work which may be taken up to supply unknown data in the lives of well known insects.

General Collectors.

Most collectors of insects, as their material accumulates, specialize their efforts and devote their attention to one or two orders. There are a few, however, who keep up their general collections and who are always glad to correspond and exchange specimens in all orders. This, of

course, is the case with the curators of public institutions, such as museums, colleges and schools. In addition to these the following are active workers in Canada :

Begin, Rev. P. A., Sherbrooke, Que.
Bethune, Rev. C. J. S., London, Ont.
Coubeaux, Eugene, Prince Albert, Sask.
Desrochers, Rev. J. E., Rigaud, Que.
Evans, J. D., Trenton, Ont.
Fyles, Rev. Thos. W., Levis, Que.
Gregson, Percy B., Waghorn, Alta.
Huard, Rev. Victor, Quebec, Que.
Lochhead, Prof. W., Guelph, Ont.
McIntosh, Wm., St. John, N. B.
Stevenson, Charles, Montreal, Que.

It will be noticed that most of the notes collected for this year's record are on the work of lepidoterists and coleopterists. A short report has kindly been prepared on Orthoptera by Mr. E. M. Walker, of Toronto, and data have been supplied for that on Hymenoptera, by Mr. W. H. Harrington, of Ottawa. Several collectors are devoting some attention to Diptera and Hemiptera, and it is hoped that by next year this material may provide data for a more extended notice of work in these orders, than is possible now. Canadian collectors are under deep obligations to the leading specialists in the United States, who at all times have most generously named material from all localities, whenever sent.

General collectors of insects frequently ask for a list covering all orders of insects, so that they may know how to arrange their collections. In most orders there is some one check list which is recognized generally ; this should be used in arranging a collection. Probably the best general list covering all orders is Dr. J. B. Smith's "Insects of New Jersey," which is a catalogue up to 1899, of all insects found in that State.

Lepidoptera.

By far the largest number of notes received refer to the Lepidoptera. For that reason, on this occasion, these insects will receive first attention. Species are referred to, not always for their great rarity, but when it is thought that a note of the occurrence in a certain locality, or upon a certain date, may prove of interest to other collectors. The species are mentioned in the order of Dr. J. B. Smith's "List of the Lepidoptera of Boreal America," 1891. Of works relating especially to Lepidoptera which have appeared in 1901, first mention should be made of Mr. Beutenmüller's beautiful "Monograph of the Sesiidae of America North of Mexico," published as a Memoir of the American Museum of Natural History, with eight magnificent plates. By the same author is a very useful "Descriptive Catalogue of the Noctuidæ found within Fifty Miles of New York City." During the year several valuable articles containing descriptions of new species have appeared, by Prof. J. B. Smith, of New Jersey, and Dr. H. G. Dyar, of Washington.

The following list gives the names and addresses of some of the most active students of Lepidoptera in Canada. There are doubtless many others, but I have not been able to learn what they have been doing during 1901 :

Anderson, E. M., Victoria, B. C.
Bethune, Rev. C. J. S., London, Ont.
Boger, H. W. O., Brandon, Man.
Brainerd, Dwight, Montreal.
Bush, A., Vancouver, B. C.
Cockle, J. W., Kaslo, B. C.
Criddle, Norman, Aweme, Man.
Danby, W. H., Rossland, B. C.
Dennis, A. J., Beulah, Man.
Dod, F. H. Wolley-, Calgary, N. W. T.
Evans, J. D., Trenton, Ont.
Fyles, Rev. Thos. W., Levis, Que.
Fletcher, James, Ottawa.
Gibson, Arthur, Ottawa.
Grant, C. E., Orillia, Ont.
Gregson, Percy B., Waghorn, Alta.
Hanham, A. W., Victoria, B. C.
Harvey, R. V., Vancouver, B. C.
Heath, E. F., Cartwright, Man.
Johnston, James, Bartonville, Ont.
Jones, W. A. Dashwood-, New Westminster, B.C.
Lyman, H. H., Montreal.
McIntosh, Wm., St. John, N. B.
Marmont, L. E., Rounthwaite, Man.
Moffat, J. Alston, London.
Norris, A. E., Montreal.
Richard, A. E., Ottawa.
Sandercock, W. C., Lauder, Man.
Suffield, J. D., Morden, Man.
Taylor, Rev. G. W., Wellington, B.C.
Venables, E. P., Vernon, B. C.
Winn, A. F., Montreal.
Wilson, E., Vancouver, B.C.
Wilson, T., Vancouver, B.C.
Willing, T. N., Regina, Assa.
Young, C. H., Hurdman's Bridge, Ont.

Of the above named, the following have made specialties of some subjects : Messrs. Brainerd, Cockle, Fyles, Fletcher, Gibson, Lyman and Young have given much attention to and are keenly interested in rearing species from the egg to the perfect insect. The Division of Entomology of the Experimental Farms is particularly interested in working out the life histories of insects, and will be grateful for all eggs or larvæ, which may be sent in by correspondents, particularly of Arctiidæ, and also of Acronycta, Agrotids and diurnals.

There are now many more interested in the study of insects than was the case a few years ago, and naturally the members of our Society have taken an active part in bringing their favourite field of research before others. Excellent work has been done by Mr. H. H. Lyman, in Montreal, by the encouragement he has always given to the members of the Montreal branch. In this work he has been ably assisted by several of the other members, notably by Mr. A. F. Winn. Similar good work has been done in St. John, N.B., by Mr. Wm. McIntosh, in Quebec by the Rev. Thos. W. Fyles, and in Vancouver by Mr. R. V. Harvey. In London the Rev. C. J. S. Bethune has put new life into the local branch. Too much cannot be said of the courtesies of Mr. J. Alston Moffat, the efficient curator of the Society's collections, to whom all our active collectors are frequently under obligations in many ways. The Toronto Branch has, during the past year, made material progress in arranging the collection of insects presented by them to the Education Department for Ontario.

Notes on Captures.

RHOPALOCERA. Melitæa harrisii, Scud. Fairly common in one locality at Orillia. (Grant.)

Phyciodes batesii, Reak. This species, which is much rarer than *P. tharos*, occurs at Ottawa and Aylmer, Que., a week or ten days sooner than the latter species. (Fletcher.)

Euptoieta claudia, Cram. A female of this species was taken at Regina on July 10, while in the act of laying its eggs on *Linum sulcatum*. Four eggs were seen to be deposited on separate plants, so that this flax, a curious food plant for an Argynnid, seems to be the natural food of the caterpillars in that district. It is also known to feed on violets, and has even been troublesome in gardens in the West from attacking pansies.

Grapta satyrus, Edwards. A fair specimen that had wintered. May 5, Orillia. (Grant.) This species is rare east of the Rockies, but very common on the Pacific coast.

Vanessa californica, Bdv. A few specimens. New Westminster. (Jones.) This butterfly is very seasonal in its appearance. It was reported as swarming in the mountains round Kaslo, B.C., by Mr. Cockle, last year. A few specimens high up on Mount Che-am in the middle of August, where it was very troublesome in disturbing more desirable species. (Fletcher.)

Junonia cœnia, Hbn. A fairly good specimen in a cutting on the railway. Orillia. (Grant.)

Limenitis weidemeyerii, Edw. One or two specimens of this species were found in the collection of Mrs. Walton, at Armstrong, B.C., where she had collected them.

Debis portlandia, Fabr. A few specimens of this butterfly have been taken at Ottawa in 1901, July 10. (Richard.)

Erebia vidleri, Elwes. In addition to the six previously known examples of this fine species, about two dozen more were taken on the 15th and 16th August last on Mount Che-am, B.C., by the writer and Messrs. A. Bush and T. Wilson, of Vancouver.

Hipparchia ridingsii, Edw. Regina, July 10. (Fletcher.) This species has also been taken in some numbers at Aweme by Mr. Criddle.

Chionobas jutta, Hbn. Mer Bleue, near Ottawa, May 31. (Gibson.)

Thecla nelsoni, Bdv. Not uncommon at Kaslo in spring. (Cockle.) This is the first record of the species being found in Canada.

Chrysophanus xanthoides, Bdv. Brandon, Man. (Boger.) Several specimens.

Lycaena sæpiolus, Bdv. This common western species seems to be gradually extending eastward. Four years ago a single specimen was taken at Nepigon. Last year in the beginning of July it simply swarmed in localities where in previous years, although visited at the same time of the year, no trace of it was seen. (Fletcher.)

Lycæna couperii, Grt. This species has never been recorded for western central Ontario, but Mr. A. W. Hanham writes that he took several specimens May 17, 1891, "two miles up from Brantford, close to the Grand River, via the Paris River road." Collectors in western Ontario should be on the lookout for the species.

Lycæna shasta, Edw. Some years ago Mr. F. H. Wolley-Dod took a single specimen 24 miles south of Calgary, but the species then disappeared. During the past summer he was fortunate enough to secure three or four more specimens. The locality seems rather far from the mountains for this species, and it is probably the farthest eastern limit in Canada. The altitude of Calgary is about 3,400 feet above the sea level.

Lycæna comyntas, Gdt. One specimen at Aylmer, Que., June 6, the second record only in the Ottawa district. (Gibson.)

Neophasia menapia, Feld. The mode of occurrence of this species in British Columbia is very remarkable. In certain years it swarms in countless myriads, the caterpillars feeding on the coast upon the foliage of the Douglas Spruce, but in the interior on the Bull Pine, *Pinus ponderosa*. Towards the end of the season, in August, the dead butterflies may be seen in vast numbers floating on the sea around Vancouver Island, or thrown up along the beach in windrows sometimes an inch or two in depth. A few specimens were seen flying in the Nicola valley on August 18 (Fletcher), and Mr. Dashwood-Jones reports that a few specimens were also taken at New Westminster.

Pieris protodice, B.-Lec. One specimen flying around golden-rods Sept. 21. The first record for Ottawa. (Fletcher.)

Colias eurytheme, Bdv. Remarkably abundant at Orillia. (Grant.) A few at Ottawa in September. (Young.)

Colias christina, Edw. Langvale, Man., June 5. (Sandercock.)

Pamphila hobomok, Harr. I have endeavored to hear of any instance of true *P. zabulon* being taken in Canada, but so far have failed. The differences between these two species are well shown by Dr. Skinner on plate 19, Entomological News, Vol. X. It would be well if Canadian collectors would examine their specimens and see if we have *P. zabulon* in Canada.

Eudamus bathyllus, S. & A. Three specimens of this butterfly, which differs from the somewhat similar *E. pylades*, Scud., by the absence of the sexual costal fold in the males, were taken by Mr. James Johnston at Hamilton, last year. Although frequently recorded from Canada, I believe that these are the first specimens which have been examined critically.

Pyrgus tessellata, Scud. A fine fresh specimen at Orillia Park, Sept. 21. (Grant.)

HETEROCERA.

Lepisesia ulalume, Strk. This rare and beautiful species has been taken several times at New Westminster by Mr. Dashwood-Jones. Mr. Harvey took a specimen this year at Vancouver. Whether it is a true species or merely a western representative form of *L. flavofasciata*, Barnst., requires investigation. Specimens of *ulalume* in some instances show very little of the black collar and have the secondaries more or less clouded with yellow. As a rule, the western form is larger than *flavofasciata*, but seems to bear the same relation to it that *Nisoniades juvenalis* does to *N. propertius* of the West.

Sphinx canadensis, Bdv. Two fine specimens of this rare hawkmoth were taken at Ottawa, June 10 and 12. Mr. Gibson, the captor, recognizing them as different from anything he had seen before, even on the wing.

Ampelophaga versicolor, Harr. Montreal, July 14. (E. D. Wintle.)

Smerinthus cerisyi, Kirby. A beautiful specimen at light, Orillia, May 20. (Grant.) Trenton. (Evans.) Rare in Eastern Canada.

Sannina exitiosa, Say. St. John, N. B. (McIntosh.) As no peaches are grown at St. John this record is interesting.

Alypia Mac-cullochii, Kirby. Montreal Island, June 1. (Stevenson). This is an interesting record. The species is common in the far East, whence it was described, also at Nepigon and in the Rocky Mountains. I have several times found the larvæ on *Epilobium angustifolium* at the latter localities and obtained the moths the following spring.

Heterocampa marthesia, Cram. A beautiful specimen of this fine moth was bred from a larva found on the ground in a beech wood at Ottawa during Sept. 1900. The moth appeared the following June. (Fletcher.)

Heterocampa biundata, Walk. A fine female was taken at light June 15, Ottawa. (Fletcher.)

Eacles imperialis, Dru. Two at light. "I never came across this till 1900." Orillia, June 24. (Grant.)

Hepialus sequoiolus, Behr. A fine specimen of this rare species was taken at Vancouver by Mr. E. Wilson ; it has been previously taken at Victoria by Rev. G. W. Taylor.

Hepialus mustelinus, Pack. One specimen, St. John, N.B. (McIntosh.)

Euthyatira pudens, Gn. One at light, the peach-blossom tint very pronounced. May 2, Orillia. (Grant.)

Semiophora youngii, Sm. ms. This new species was reared from the larva and collected by Mr. Young last season. Mer Bleue, near Ottawa. Aug. to Sept. (Young.)

Peridroma astricta, Morr. Kaslo, B. C. (Cockle.) Mr. Cockle sent eggs to Ottawa under date July 30. The larvæ were full grown in October. Cartwright, Man. (Heath.) Specimens sent by Mr. McIntosh from St. John, N. B., were identical with the western form.

Noctua substrigata, Sm. A fine specimen taken at Brandon. (Boger.)

Feltia robustior, Sm. A specimen of this newly described species was taken at Brandon. (Boger.)

Carneades quadridentata, G. & R. This species was recorded in Bull. 18, 1899, Nat. Hist. Soc. of N. B., by W. McIntosh (teste H. Strecker), "but the species has proved from better specimens submitted to Prof. J. B. Smith to be *C. detersa*. Three specimens were taken in 1901." (McIntosh). *C. detersa* is a widely distributed species and under the name of *C. pitychrous* is included in many lists.

Mamestra rugosa, Morr. Mer Bleue, near Ottawa, May 31. (Gibson.) A remarkably bright specimen, the first Ottawa record. Two specimens, St. John. (McIntosh.)

Carneades mollis, Wlk. (*C. fernaldi.*) Two or three specimens mid-July. (McIntosh.)

Homohadena badistriga, Grt. Several specimens bred from larvae found on honeysuckle. Ottawa. (Fletcher.)

Oncocnemis atrifasciata, Morr. A fine specimen of this beautiful moth, St. John, N. B. (McIntosh.) Rounthwaite, Man. (Marmont.)

Prodenia lineatella, Harv. Ottawa, October. (Fletcher.) Trenton. (Evans.)

Eupsephopœctes procinctus, Grt. This fine noctuid (two or three specimens) was taken at "sugar" at Brandon, Man., by Mr Hanham. Several specimens were bred by Messrs. T. Wilson and A. Bush, from troublesome cutworms feeding on vegetables in gardens at Vancouver, B. C., in company with *Peridroma saucia* in 1900.

Gortyna ærata, Lyman, n. sp., described in Can. Ent. XXXIII, No. 12, p. 319.

Achatodes zeæ, Harr. Several specimens of this neat little moth were bred from caterpillars boring in the young shoots of elder, *Sambucus*. Kingston and Ottawa. Imagoes July 6. (Fletcher.)

Tæniocampa oviduca, Grt. Trenton, rare. (Evans.)

Scopelosoma devia, Grt. St. John, N. B. (McIntosh.) One specimen. Had previously been taken here once before, May 15 ,1898.

Xylina thaxteri, Grt. One specimen Ottawa Apl. 23. (Young.)

Plusia thyatiroides, Gn. At light Aug. 24, Orillia. (Grant.) St. John. (McIntosh.)

Plusia dyaus, Gat. At flowers in town park, Orillia, Oct. 10. (Grant.)

Plusia flagellum Walk. St. John, N. B. (McIntosh.)

Catocala elda, Behrens. A few specimens, New Westminster. (Jones.) Vancouver. (Bush. This beautiful species which resembles the European *C. fraxini* much more than the American *C. relicta*, of which it is supposed to be a variety, was bred by the Rev. G. W. Taylor many years ago from a larva found at Victoria on Oak.

Erebus odora, Linn. This strong-winged wanderer from the West Indies has this year been reported from as far west as Calgary, where a specimen was taken by Miss Moodie of that place. Last year Mr. Hanham secured one at Winnipeg, and Mr. Dennis another at Beulah, Man. Mr. Grant took a perfect female " at sugar " at Orillia, July 6.

Homoptera woodii, Grote. " A beauty, at sugar, " June 10, Orillia. (Grant.)

Leucobrephos middendorfi, Men. A pair of this rare and interesting moth taken at Aweme, Man., early in the spring, " extremely difficult to see and to follow." (Criddle.)

Varieties.

Argynnis lais, Edw. Some beautiful suffused varieties of this species have been taken at Aweme by Mr. Criddle, and during the past summer a handsome specimen somewhat resembling the figure of *A. platina* shown on plate 13, Ent. News, XII, No. 10, was taken at Beulah, Man., by Mr. Dennis. This specimen has three large basal silver blotches and a sub-marginal band of large silver spots. The primaries are more suffused with black than in the figure referred to. A fine painting of this and Mr. Criddle's own specimens were exhibited at the annual meeting.

Vanessa Antiopa, var. *Lintnerii*, Fitch. A fine specimen, with very wide border. was this year bred at Ottawa, July 10th. This is not a true variety, but merely an accidental form which can be produced at will. (Fletcher.)

Lycæna neglecta, Edw. Mr. A. F. Winn caught last year at Bideford, Maine, on July 14th, a very fine gynandromorph of this species, the left side of which was female and the right male.

Coleoptera.

There are many who are collecting beetles in Canada, but, unfortunately, few records have been received, compared with those which have come to hand from lepidopterists.

The following are the names of some of the most active collectors :

Bethune, Rev. C. J. S., London, Ont.

Chagnon, Gus., Montreal, Que.

Crew, R. J., Toronto.

Evans, J. D., Trenton, Ont.

Fletcher, J., Ottawa, Ont.

Hanham, A. W., Victoria, B.C.

Harrington, W. H., Ottawa, Ont.

Keen, Rev. J. H. Metlakatla, B.C.

McIntosh, Wm., St. John, N.B.

Taylor, Rev. G. W., Wellington, B.C.

Mr. Keen has sent few records this year, but no one has done more to increase our knowledge of rare species from the extreme north-west coast than he has. He collected assiduously

for many years on the Queen Charlotte Islands, and has recently moved to his present address.

NOTES OF CAPTURES.

Cicindela limbata, Say. Reported by Mr. Hanham as found on the sand hills bordering the Douglas swamp, Man., on June 18, 1899. "They looked like large white spiders skimming over the sand. I found them copulating buried in the sand, with just their heads showing."

Cicindela pusilla, Say. This rare species was taken by Mr. L. E. Marmont, at Rounthwaite, Man., and also by Mr. Hanham, at Bird's Hill, near Winnipeg, in 1900.

Cychrus tuberculatus, Harr. This rare and handsome species is occasionally taken in Vancouver Island. Comox, B.C. (Taylor, Fletcher, and Prof. J. Macoun.) The Rev. J. H. Keen found it not uncommon at Massett, on Queen Charlotte Islands. Two fine specimens were taken at Coldstream, twelve miles from Victoria, in June last. (Hanham.) The food of beetles of the genus *Cychrus* is generally stated to be snails, but Mr. Hanham writes: "I have found *Cychrus angusticollis* and *C. marginatus* in colonies in rotten stumps evidently preying upon slugs, which were with them. I think, for every snail they get here, they get one hundred slugs. I have caught *C. marginatus* in my garden feeding on slugs."

Cychrus angulatus, Harr. This very rare species has been again taken on Vancouver Island by the Rev. G. W. Taylor. Superficially, it resembles the black form of *C. angusticollis*, but has the thorax differently shaped, and the punctuation and striation of the elytra are quite different. "Near Brennan Creek, July 1, I have only seen three in nineteen years." (Taylor).

Carabus nemoralis, Mul. This interesting carab was first recorded by Dr. Horn as a Canadian species in 1891. Later in the same year Mr. Harrington took several specimens at St. John, N.B., associated with another European species, *C. granulatus*, Dej., and published a note in the Canadian Entomologist, 1891, p. 112. Mr. McIntosh now finds both of these species abundant at St. John, and speaks of *C. granulatus* as our commonest ground beetle.

Pasimachus elongatus, Lec., taken not uncommonly at Aweme. (Criddle.) Under stones in the Brandon Hills. (Hanham.)

Clivina pallida, Say. St. John, N.B., rare. (McIntosh).

Dicœlus sculptilis, Say. "This species was not uncommon in Winnipeg in 1894. I have not seen a specimen since." (Hanham.)

Platynus clemens, Lec. Rare in Canadian collections. Originally described from Nova Scotia. St. John, N.B. (McIntosh.)

Platynus hardyi, Lec. This beetle has been taken on the sea shore in Nova Scotia in former years by Mr. Harrington; also, in numbers along the Nepigon River. (Fletcher.) Common, St. John, N.B., 1901. (McIntosh.)

Chlænius purpuricollis, Rand. One specimen taken at Brandon, September 27, 1900. Another was taken on almost the same spot, April, 1897. (Hanham.)

Chlænius interruptus, Horn. "In May, 1898 and 1899, this species was abundant along a short piece of railway line, two or three hundred yards, near Winnipeg." (Hanham.)

Tanyrhinus singularis, Mann. One flying October 24, 1898. Gabriola Island, B. C. (Taylor.) Massett, Q.C.I. (Keen.)

Adranes taylori, Wick. Two or three found in April and May in the nest of a yellow ant, Gabriola Island and Nanaimo. (Taylor.)

Mysia hornii, Cr. A few on currant bushes, Gabriola Island. (Taylor.)

Aphorista læta, Lec. Under bark of alder and hemlock, March to May, Nanaimo. (Taylor.)

Mycetina hornii, Cr. Nanaimo, May 22. One under bark of fallen fir, April 30. (Taylor.)

Perthalycra murrayi, Horn. Nanaimo, May 22. (Taylor.)

Derodontus trisignatus, Mann. In fungi, Wellington, B.C., November. (Taylor.)

Nosodendron californicum, Horn. About 20 in a crevice of bark of *Picea grandis*, May 13th, Wellington. (Taylor.)

Acmæodera pulchella, Hbst., and *A. culta*, Web. Specimens of these pretty little Buprestians were taken on the flowers of Butterfly Weed, *Asclepias tuberosa*, at Komoka, Ont., July 13. (Bethune.) Neither of these species had previously been recorded from Canada.

Chrysobothris pusilla, Lap. and Gory. Ottawa, rare. (Fletcher, Harrington.) St. John, N. B. (McIntosh.) One specimen in each case.

Endeodes collaris, Lec. A few specimens of this rare species were taken by Rev. G. W. Taylor at Victoria.

Listrus motschulskii, Lec. Common on blossoms of Amelanchier at the end of April, Wellington, (Taylor.)

Polycaon stoutii, Lec. One specimen in twig of apple tree, Nanaimo, (Taylor.)

Molorchus longicollis, Lec. One on crab blossom, Gabriola Island, May 25. (Taylor).

Ulochætes leoninus, Lec. Two specimens on July 2 and 14, Nanaimo, and Gabriola Island. (Taylor.) Vernon, B.C. (Fletcher.)

Acanthocinus obliquus, Lec. Quite common on a fence near poplars, August and September, 1899 ; not seen since. (Taylor.)

Pachyta armata, Lec. Four specimens of this handsome beetle were taken flying round flowers, at an altitude of 7,000 feet, on Mount Che-am, B.C., August 15. (Fletcher.)

Anthophylax malachiticus, Hald. Six specimens flying low in a beech wood, Aylmer, Que., 1900, and eight specimens in the same place, June, 1901. (Fletcher.)

Anthophylax attenuatus, Hald. Three specimens, St. John, N.B., July. (McIntosh.) Ottawa, very rare ; one specimen, June. (Young.) Another specimen was taken at Ottawa many years ago by Mr. Harrington.

Anthophylax mirificus, Bland. Both sexes. Vernon, B. C. (E. P. Venables.)

Leptura Matthewsii, Lec. Pine Creek near Calgary (Wolley-Dod). Vernon, B.C. (E. P. Venables)

Priognathus monilicornis, Rand. A widely distributed but usually rare Œdemerid. One specimen under log, St. John. (McIntosh.) Several flying in May, Wellington, B.C. (Taylor.)

Rhinosimus pallipes, B. and L. One only, April, 24. (Taylor.)

Asclera nigra, Lec. Gabriola Island ; four specimens. May 13-15. (Taylor.)

Orchesia ornata, Horn. One on apple blossoms, May 4 ; Gabriola Island. (Taylor.)

Hymenoptera.

Some good work has been done in this order during the season. The most active workers have been the following: Mr. W. H. Harrington, of Ottawa, who continuously adds to his own extensive collections and has also done good work in the way of identifying specimens and helping others. The writer gratefully acknowledges many favours in the determination of parasites bred from larvæ collected in the field and from scale insects. Mr. Chagnon, of Montreal, continues his studies of this order, and Rev. G. W. Taylor, of Wellington, Vancouver Island, has also added considerably to the knowledge of British Columbian Hymenoptera.

The attention of our own members may be profitably directed to the recent systematic work of Mr. W. H. Ashmead, of Washington, undoubtedly the highest authority on American forms. His monographic writings have added immensely to the knowledge of these insects, and his recent scheme of classification marks a great advance upon that of Cresson, published in 1887. It has been adopted by Howard in his admirable "Insect Book." Such portions of the

classification as have appeared must be carefully studied by all workers in this vast and difficult, but most interesting order. Ashmead divides the Hymenoptera into ten superfamilies, viz., *Apoidea*, *Sphecoidea*, *Vespoidea*, *Formicoidea*, *Proctotrypoidea*, *Cynipoidea*, *Chalcidoidea*, *Ichneumonoidea*, *Siricoidea*, *and Tenthredinoidea*. These are subdivided into ninety-four families. The parts of the classification already published are the following ;—(1) The Ichneumonoidea, by the United States National Museum (Proc. XXIII., No. 1206), in which over eleven hundred genera are tabulated. (2) The Apoidea, in Trans. Am. Ent. Soc'y., 1899. (3) The Sphecoidea in the Canadian Entomologist for 1899 and (4) The Vespoidea (in part), in the same publication in 1900. The continuation of this most important and satisfactory work will be welcomed by all interested. It is much to be regretted that a larger number of our Canadian entomologists do not devote more attention to the Hymenoptera. Most attractive fields of study, with ample room for original observations, are offered in each superfamily, especially in connection with the social groups of bees, wasps, and ants, as well as in the great complex of parasitic species which play such an important role in the control of injurious insects in all orders. We trust that next year's record may be able to show that some useful work has been performed in this fertile field.

Among interesting captures mention may be made of the following :—

Bœus niger, Ashm. Reared at Ottawa from a batch of spider's eggs ; 4 males and 20 females. (Harrington.)

Hecabalus lycti, Cresson ; and *Hecabalus utilis*, Cresson. Reared in large numbers at Ottawa from axe handles infested by the Powder-post Beetle (*Lyctus unipunctatus*). The parasites most abundant in June and October. (Fletcher.)

Abia kennicotii, Nort. One specimen at Trenton. (Evans.) This is by no means a common insect, although odd specimens are occasionally taken. The pretty white larvæ, spotted with yellow and black, may sometimes be found on Honeysuckle.

ENTOMOLOGICAL RECORD: ORTHOPTERA.

CONTRIBUTED BY MR. E. M. WALKER. (TORONTO.)

The marked progress that has been made in the study of North American Orthoptera during the past few years has shown no sign of abatement during the present year, although very little has been done to further our knowledge of the Canadian fauna, nor does the writer know of anyone in the country who is specially interested in this order. It is to be hoped that this state of affairs will soon pass away, since, owing to the tireless energies of Mr. Scudder, it is now a very simple matter to obtain the literature necessary to a student of the order. With Scudder's "Guide to the Classification of N. A. Orthoptera," the "Catalogue of N. A. Orthoptera," and the "Index to N. A. Orthoptera," the student should experience little difficulty in arranging his collection. The Index is by far the most important work on N. A. Orthoptera that has appeared during the present year, and too much can hardly be said in its praise. It is absolutely indispensable to the student, and contains remarkably few errors. One feature of this work, particularly, which is one of immense value, is the full list of localities given under each reference. By this means the student can learn accurately the distribution of any species.

Of other writings on Orthoptera published during the year, some of the more important are the revisions of several of the smaller genera by Scudder ; a few papers by Morse, such as "New N. A. Orthoptera" (Can. Ent., XXXIII., 129) ; "The Xiphidiini of the Pacific Coast," (Can. Ent., XXXIII. 201) ; "Revision of the Orthopteran Genus Trimerotropis," by J. McNeill (published by U. S. Nat. Mus.), are important papers, in which 24 new species are described ; and "Notes and remarks on Mexican Orthoptera, with descriptions of new species," and other papers, by J. A. G. Rehn. The "Insect Book," by Howard, must

not be omitted, as it will be of great benefit to the beginner, and the plates will serve to give a good idea of the general appearance of most of the genera he is likely to meet with.

In regard to Canadian Orthoptera, it may be mentioned that, since the last instalment of the writer's "Notes on some Ontario Acridiidæ" was printed, he has added four more species to the number, and is now engaged in preparing a complete list of the Acridiidæ of Ontario. These four species are the following :—

Tryxalis brevicornis, L. Pt. Pelee, Aug. 8, 1901.

Orphulella pelidna, Burm. Sarnia, Aug. 12 and 14, 1901.

Trimerotropis huroniana, n. sp. Southampton, Aug. 20, 21, 29, 1901.

Paroxya floridana, Thos. Arner, Aug. 9, 1901.

Nothing of any importance has been written on the other families of Orthoptera in Canada, but the writer has for some years been making a collection of the Ontario forms, and will soon have a preliminary list of the Locustidæ ready for publication. Of the last-named family only eight species have been recorded from Ontario, and the lists from the other parts of Canada are no better. The writer, however, has taken twenty-two species in the province, seven of these having been taken for the first time this season. They are the following :—

Scudderia texensis, Pict.-Sauss. Pt. Pelee, Aug. 8 ; Arner, Aug. 9 ; Sarnia, Aug. 12, 14 ; Walpole Island, Aug. 13.

Conocephalus Nebrascensis, Bruner. Sarnia, Aug. 12.

Orchelimum nigripes, Scudd. Pt. Pelee. Aug. 7.

" *indianense*, Blatchl. Sarnia, Aug. 14 ; Arner, Aug. 8.

" *longipenne*, Scudd. Pt. Pelee, Aug. 8 ; Walpole Island, Aug. 13.

Xiphidium attenuatum, Scudd. Pt. Pelee, Aug. 8 ; Walpole Island, Aug. 13.

Atlanticus pachymerus, Scudd. Arner, Aug. 9.

Of the Gryllidæ and Blattidæ, the writer's collection contains a number of species as yet unrecorded from Canada. Of these, a few Gryllidæ were taken this year for the first time, *Nemobius palustris*, Blatchl., from Sarnia, Southampton, Owen Sound (Aug.), and Lake Simcoe (Sept.) : and *N. maculatus*, Blatchl. (Tobermory, Aug. 25), being noteworthy. The others have not yet been satisfactorily determined.

Collections of Orthoptera were made at the following localities during the past season :—

Toronto, Lake Simcoe, Leamington, Point Pelee, Arner, Chatham, Sarnia, Walpole Island, (St. Clair River) ; Goderich, Southampton, Tobermory, and other points in the Bruce peninsula and Owen Sound.

In addition to the above, collections of Orthoptera have been made at Aweme, Man., by Mr. Norman Criddle ; also in Central Manitoba and in the Okanagan and Nicola valleys, in British Columbia, by Dr. Fletcher.

A DAY AT THE MER BLEUE (EASTMAN'S SPRINGS, ONT.).

By Arthur Gibson, Ottawa.

An excursion to the Mer Bleue at any time from April to November is always of keen interest to Ottawa entomologists. The nature of the locality, and the varied forms of life to be met with there, all tend to entice those who delight in observing and collecting specimens of natural history. The name Mer Bleue is applied to a vast peat bog, which at one point comes close to Eastman's Springs, Ont., and being in a comparatively undisturbed state, as far as the interference of man is concerned, naturally at once suggests itself as a favourite resort for naturalists. Local investigators have always considered this large swamp, and its immediate vicinity, a most lucrative point at which to collect. The members of the Ottawa Field Naturalists' Club have on several occasions journeyed in a body to Eastman's Springs to spend the day collecting, etc., and on all such excursions many interesting plants, insects, etc., have been found.

On the 30th May, 1901, Dr. Fletcher, Mr. W. E. Saunders, of London, Ont., Mr. C. H. Young, of Hurdman's Bridge, and the writer, spent a delightful and successful dav at the Mer Bleue. After a 12 mile drive from Mr. Young's residence on the Rideau River, about 10 a.m. we reached the house of our good friend Mr. Manus, who on all such occasions receives us hospitably and kindly allows us to "put up" our horse, etc., for the day. Mr. Manus's house is close to the edge of the swamp, and on the above mentioned date, as soon as we had donned rubber boots, or an old pair of ordinary boots, and ladened ourselves with collecting apparatus, lunch, etc., we immediately headed for the bog. The morning was rather overcast and there was just enough wind to keep down the mosquitoes, which naturally swarm on the bog. This advantage, however, somewhat prevented other and more desirable insects from flying.

Close to the swamp *Pyrausta octomaculata*, with its quick, flighty movements, was readily noticeable and very abundant. After passing through a rather obstructive thick growth of alder, which fringes the margin of the sphagnum carpeted bog, and wading in water sometimes up to our knees for about ten minutes, we reached the swamp proper and at once began collecting. Just at the entrance is a small cleared space of quaking bog covered with cranberries, and with a bubbling gas spring in the middle. Here we stopped a few minutes to drink the water, and to light the bubbles of gas as they rose to the surface. The first specimen found was a nice fresh example of *Hemaris thysbe*, which had just emerged, the wings being still quite soft. *Thecla augustus*, which is always a frequenter of the Mer Bleue, was the first diurnal taken, but it was a little late for perfect specimens. We were hoping to find the larva of this species, but we were too late. This Thecla is fairly abundant every season in this locality, and as nothing is known of the earlier stages of this interesting species, we were anxious, if possible to learn something about it. Several females were followed and watched carefully to see if we could detect them in the act of laying eggs. Dr. Fletcher has reared the closely allied *T. iroides* from caterpillars found feeding on green apples in Vancouver Island, and was of the opinion that the food of the larvæ of *T. augustus* would prove to be the green berries of the Blueberry, or the capsules of some Ericaceous plant, of which there were many kinds growing in profusion on the bog. The females rested for tantalizingly long periods on flower clusters of *Kalmia glauca* and *Ledum latifolium*, both of which were in flower, as well as on the now flowerless bushes of *Cassandra calyculata* which occurred everywhere, but not a single egg could be found.

Over the whole of this immense swamp the aromatic white-flowered Labrador Tea (*Ledum latifolium*), the Leather Leaf (*Cassandra calyculata*), the Sheep-laurel (*Kalmia glauca*), and the delicate Andromeda (*Andromeda polifolia*) were in great profusion. Flying among these, as well as among other plants, were hundreds of specimens of the following geometers, usually to be found in swamps at this season : *Nemaria grataria*, *Fidonia truncataria*, *Eumaturga faxonia*,

Semiothisa granitata, and *Epirranthis obfirmataria*. It was a little late for these species, but nice examples of all were taken.

The most interesting discovery of the day occurred after we had been in the swamp for about an hour, when our attention was drawn to the destruction which had been wrought to the young tamarac and spruce trees (*Larix Americana* and *Picea nigra*). Many of these young trees, particularly towards the top, were denuded of their foliage. After a careful investigation of the branches and remaining leaves, without any insects being found, it occurred to us to examine the moss at the base of the trees. This was not in vain, for as soon as we began to remove the wet moss from the base of the trees, we discovered evidence of the presence of larvæ, by finding some frass, and upon further examination soon located the culprits. These caterpillars were from three to six inches below the surface of the wet moss, and of course were simply hiding during the day, until nightfall, when they would again ascend the trees and begin feeding. Later, however, Dr. Fletcher found a few specimens of the larvæ feeding on the foliage. The trees which were most attacked were small ones, from two to four feet high. About 25 specimens of the larvæ, in all, were collected, but unfortunately only those cared for by Mr. Young produced imagoes. The larvæ collected by Dr. Fletcher and the writer, although feeding well in confinement, and pupating in a healthy condition, failed to give the moths. Some of Mr. Young's specimens were forwarded by Dr. Fletcher to Prof. J. B. Smith, for identification, and the species proves to be a new one to science. In 1899 Mr. Young took one specimen of the moth at the Mer Bleue on the 30th August, and another specimen was taken by him in the same locality last year, early in September. Prof. Smith has named this species *Semiophora Youngii*, in honour of the discoverer. The caterpillar is from about an inch and a quarter to nearly an inch and a half in length, and, for a caterpillar, is a beautiful creature. A description will be given in the Annual Report of the Entomologist and Botanist, to the Dominion Experimental Farms for 1901. The moth is also a beautiful species, varying considerably both in colour and distinctness of markings ; it expands about an inch and a quarter.

As the morning was dull and cloudy, I was in hopes that the sun would come out, at least for a while, during the afternoon, as I was anxious to see *Chionobas jutta* flying, the Mer Bleue being one of the few localities in Canada where this interesting butterfly has been found. My hopes were not disappointed, for soon afterwards the clouds broke and the warm sun appeared in all its glory. It had hardly done so when just ahead of me I noticed a large brown butterfly flying rather quickly. Of course, I immediately gave chase, and in about a minute had netted my first specimen of *Chionobas jutta*, which proved to be a perfect female. Several other specimens were afterwards caught in tolerably good condition. This butterfly, although not very difficult to catch, has the habit of resting on dead branches and trunks of trees, where it is protected considerably by the resemblance of the under side of the wings to the bark, and where it is very difficult to catch.

In the twenty-fifth Annual Report of the Society, Dr. Fletcher published an article on the Pitcher-plant Moth (*Exyra rolandiana*). As neither Mr. Young nor I had ever seen the larva of this pretty little moth, we were anxious to see it at work, and were much interested when Dr. Fletcher, who knew its habits, called us to examine some infested pitcher plants (*Sarracenia purpurea*). We had not looked very long before specimens of the caterpillar were found, their presence being easily detected, as stated in the above article, by the brown dead patch on the leaf, where the caterpillar had fed for a time the year before and which showed plainly on the outside, also by the mouth of the pitcher having been drawn together somewhat, and the remaining space closed up with a web of fine silk. The caterpillar is an attractive one, as the following description, taken from Dr. Fletcher's article, will show : "Length when extended, three quarters of an inch ; spindle-shaped ; distinctly segmented ; general outline closely resembling the larva of *Xanthoptera semicrocea*, figured by Prof. Riley on page 208 of the Canadian Entomologist, Vol. VI, but lacking the fleshy processes of the abdominal segments ; head

and first segments small ; segments 2-7 gradually enlarging to 3 mm., and then tapering to the posterior extremity ; each segment velvety claret colour, the velvety pile only in the central part of the segments ; the intra-segmental sutures smooth, pale, in some specimens almost white; head white, marked symmetrically on each side with three black marks, the uppermost almost round, the middle one crescent-shaped, and the lowest above the ocelli, comma-shaped ; spiracles brown, ringed with black ; on each segment about six small black tubercles bearing slender tawny bristles ; thoracic feet and prolegs darkened externally." The pitcher plant is very abundant at the Mer Bleue, and we soon found a number of the larvæ. These were in different stages of development, from about three-eighths of an inch to full grown larvæ. One pupa was also found in one of the plants. The moth " is a small, thick-set insect, about three-eighths of an inch in length, of a dark, metallic, purplish hue, which on the forewings is relieved by a yellowish discal patch. The base of the wings is deep red. The dark colour on the wings of the female is much blacker than in the other sex. The hind wings in both sexes are black. When at rest, the wings are sloped like those of a Plusia."

Lithacodia bellicula, a pretty little noctuid, was fairly common, and some nice fresh specimens were secured. Two other interesting noctuids were captured, viz. that beautiful, and extremely difficult to catch, little species, *Anarta cordigera*, which had been taken here before, and which we were specially on the look-out for, and *Mamestra rugosa* ; one specimen of the former was collected by Mr. Young, and one of the latter by the writer, this being the first record of the occurrence of *M. rugosa* in the Ottawa district.

Argynnis triclaris always an interesting butterfly is also a frequenter of the Mer Bleue, but on account of its rarity few specimens are found. We were in hopes of meeting with this insect, and, although we watched for it throughout the day, no specimen was captured. A few Argynnids were noticed flying, and specimens of *bellona* and *myrina* were caught. Whether any of those observed were *triclaris*, we could, of course, not be sure. The species flies about a fortnight later, Dr. Fletcher having taken specimens at the Mer Bleue on the 11th June one year and on the 16th June another year.

Doubtless, if the weather had been more favourable, other interesting lepidopterous insects would have been observed. Specimens of coleoptera, hymenoptera and diptera were collected and some rather rare species secured. These insects would, of course, have been more plentiful, had the day been brighter.

While Dr. Fletcher, Mr. Young and the writer were occupied the greater part of the day in hunting for insects, or in collecting plants, Mr. Saunders who is an ardent ornithologist, armed with his field glass, was busily engaged the whole time "looking up" birds and studying their ways. Some nice nests, with eggs, of the Palm Warbler, the Nashville Warbler, the Swamp Sparrow, and the White-throated Sparrow, were secured, and many useful notes were made upon the habits of the birds mentioned.

We reluctantly turned our steps homewards as evening came on, well loaded down with specimens of plants and insects, and with some clutches of rare eggs, determined if possible to return again next year, a little earlier in the season, so as to tackle the problem of the food plant of *Thecla augustus*, and later to learn something of the life-history of *Chrysophanus epixanthe*, which swarms on the Mer Bleue about the 1st July.

COMMERCIAL ENTOMOLOGY, OR INSECTS AND INSECT-PRODUCTS MET WITH IN COMMERCE.

By Charles Stevenson, Montreal.

Everyone is familiar with the valuable place that the silkworm holds in commerce. But it would surprise many persons if told how many of those creatures familiarly known as "bugs" command a price in the market, and very incredulous some would be, if informed that the only too common "bed-bug," *Acanthia lectularia*, Linn., or "B-flat," as it was called by a musical wag, is used as a drug. A certain school of practitioners prescribe this pest in the form of a tincture, as well as another "bug-bear" of the cleanly housewife—the cockroach, the species *Periplaneta Americana*, Linn., being specified for the purpose. Not long ago, *Periplaneta orientalis*, Linn., the "oriental roach" or "black beetle," a native of Asia, which is now found in most parts of the civilized world, was recommended for the same use as the "blister beetle" or "Spanish fly," *Cantharis vesicatoria*, Linn,, which is an official drug in both the allopathic and homœopathic pharmacopœias. The Spanish blister beetle is indigenous to southern and central Europe, living on the ash, lilac and elder trees. It is of a brassy green colour, and is collected in Spain, Italy, Hungary and Southern Russia, but that which comes from the latter country is most esteemed and is larger and of a copper colour. Several American species are found to possess efficient vesicating properties ; among them may be mentioned the "potato-fly," *Epicauta vittata*, Fab., which has the thorax black and the wing cases with yellow stripes ; *E. cinerea*, Fab., a black species , *E. marginata*, Oliv., another black species, with ash-colored margins on the elytra ; *E. atrata*, Fab., uniformly black, and smaller than those previously mentioned. There is a species very abundant in Kansas and Colorado, *C. Nuttali*, Say, which closely resembles the true Spanish blister-beetle, and has also attracted attention in pharmaceutical commerce.

Two vesicating insects, *Mylabris cichorii*, Fab., and *M. phalerata*, Pallas, indigenous to East and South Asia, and also to some districts of Africa, are now imported as "Chinese blistering flies, and are found to be quite as efficient as the official insect. *Lytta gigas*, Fab., of the East Indies, is also sometimes met with in commerce.

The "oil-beetle," *Meloe majalis*, is prescribed in homœopathy as a tincture, to make which the living insect is drowned in alcohol.

If allopathic medicine were to give way to the doctrine of "*similia similibus curantur*," farmers might be able to form a "combine" for the supply of the "Colorado potato-beetle," *Doryphora decemlineata*, Say, that insect being the base of a certain tincture, made by taking the living insects, one part, crushing them, adding five parts of alcohol, macerating for eight days in a dark, cool place, shaking twice a day, and then pouring off the liquid, straining and filtering. In the same way medicines are made of several spiders, and a trituration is prepared of the freshly-spun webs of the genus *Aranea*.

Although entomologists have often raised spiders for purposes of scientific observation and investigation, spider-raising as a money-making industry is somewhat novel. One has only to go four miles from Philadelphia on the Lancaster pike, to the farm of Pierre Grantaire, and see what can be found nowhere else in the United States, and abroad, only in a little French village in the department of the Loire. Pierre Grantaire furnishes spiders at so much per hundred for distribution in the wine vaults of merchants and the *noveaux riches*.

In some forms of practice several "live" insects that possess poisons are used in making tinctures ; they are irritated or aggravated so as to make them "throw off" by shaking or stirring them up in a jar or bottle. One of these creatures that is "first made mad" before the introduction to alcohol is the "hornet" *Vespa crabo*, Linn. ; another is the well-known "honey bee," *Apis mellifica*, Linn. Besides the tincture of the whole insect, the pharmacist prescribes

the virus, to be obtained in the following way: "Draw out the sting, together with the poison bag, from a bee freshly killed. Take hold of the bag, insert the point of the sting into a small glass tube and squeeze the poison into it, or take a small bee with a pair of pincers and allow it to seize a small lump of sugar, which will absorb the poison." This hymenopterous fly is an important factor of the produce market, being the manufacturer of a wax much used for many purposes, and that sweet article of household use, as also in dispensing drugs—honey.

Other victims of the pharmacist are the bright-red minute Acarus *Trombidium muscæ domesticæ*, which the pharmacopœia states is "found under the wings of the common fly in Philadelphia." The aphis or plant louse of *Chenopodium glaucum*, and the red ant, *Formica rufa*, Linn. Nor does the gardener's friend, the "Lady-bird beetle," escape, for the "live insects" are "pounded to pulp" and triturated with sugar of milk.

It is recorded that the Greek barber surgeons of Asia Minor valued ants for holding together the edges of a cut. They held a large *Camponotus* in a forceps and when it opened its mandible, wide, it was permitted to seize the edges of the cut, which were held together for the purposes its head being cut off as soon as a firm grip was made. A similar practice was observed in Brazil several years ago by M. Morqueys of Rouen, and is cited by Sir John Lubbock but is not mentioned by either Bates or Wallace.

The bushmen of the South African district Kalahai set a high value on the leaf-beetle *Diamphidia*, as they use its juice and its larva for poisoning their arrow-heads.

For the Arts and Technical Sciences, there are several insects that are of great value. We have to thank a small Mexican scale-insect *Coccus cacti*, Linn. for the brilliant colour called cochineal which has superseded even the splendid and regal "Tyrian purple" of ancient days. It is used in the manufacture of dyes, paints and in pharmacy and also for coloring confectionery. It is of no value in medicine although it has been used as an "anodyne, tonic, astringent" Another important hemipterous insect is the West Indian *Coccus lacca*, Kerr. the female of which punctures the young branches of several tropical trees, thereby producing a resinous product called, lac, stick-lac, or shellac, used in the manufacture of varnishes, sealing-wax and a dye called Lac-lake. Indian cochineal is prepared from stick-lac and imported from India for coloring woollen and silk-goods. Its colour is similar to, but less brilliant than cochineal. *Coccus ilicis*, Fab. supplied the famous dye KOKKOS of the Greeks, Coccus of the Romans, Kermes of the Arabs, Cocchi of the Italians and Al-kermes of the Persians. Though a larger species than *C. cacti* its colour is inferior and less in quantity. Chinese-wax is the produce of a similar insect *Ericerus pela*.

In Syria a peculiar secretion called Manna is produced by the punctures of the female *Coccus manniparus*, Fab. on the young shoots of the *Tamarix mannifera*, Ehrenberg. It is a kind of reddish syrup containing glucose, dextrin, and cane-sugar, and is eaten by the Arabs and the monks of Mount Sinai like honey with their bread. There is another product which goes by the same name in the drug trade, but it is not the same, it consists principally of a sugar called mannite. There are several other saccharine products of insects which have been classed with Manna, but they are not entirely soluble in water. The term manna is more interesting historically than the article now known by that name. It was originally applied to the food so miraculously supplied to the Israelites during their wanderings in the wilderness. What that substance was we do not know. The natives around Mount Sinai believe that the substance collected by them is what the children of Israel fed on.

That rapacious insect, the migratory locust *Œdipoda migratoria*, Linn. is valued as an article of food in Arabia and Egypt. They appear in the markets preserved in brine or sun-dried and are even exported as an article of commerce. Some authorities claim that it is the insect which St. Matthew (III. 4) refers to when he says "John's meat was locusts and wild honey" and in Leviticus (XI. 22) we find that locusts constituted a common food among the Jews.

In Tokio, Japan, twelve varieties of katy-dids or bell-insects, are sold, nine of which are bred in captivity. The purchasers keep them in cages for the sake of their musical sounds, as we do song birds.

The essential constituents of ordinary writing ink are galls mixed with iron sulphate and gum. These galls are produced by a small hymenopterous insect *Cynips gallæ-tinctoriæ*, Oliver, on the *Quercus infectoria*, Oliver, of the Levant. That instrument said to be mightier than the sword is dependent on a very small creature for its power. There are many other galls but they are not much in demand.

It is well known that what is perhaps the richest and most elegant apparel which adorns the human race is the product of a caterpillar,—the silk-worm,—*Bombyx mori*, Linn. Much attention has been given of late to other silk producing larvæ, many of whose products are being found of service, especially :—*Philosamia cynthia*, Drury, the Ailanthus moth. *Antheræa mylitta*, Drury, the Tussah moth. *A. yamamai*, Guer. of Japan and several similar moths.

During recent years the exporting and importing of insects by Economic Entomologists has been resorted to, for the purpose of preying on other insects that may be destroying food-plants.

In closing this short review of the role of insects in the commercial world, attention might be called to the fact, that there are many persons who make more than a livelihood by collecting and selling Entomological specimens to collectors and curiosity hunters, the experiences and anecdotes of whom are often very entertaining.

THE FOOD OF THE GRASS SNAKE.

By J. B. Williams, F.Z.S., Toronto.

There was an article in the Annual Report for 1896 on Insectivorous Mammals,* and the relationship which they sustain, on account of their food habits, to Economic Entomology.

I find that the food habits of one of our Reptiles,—the little Grass Snake (*Liopeltis vernalis*, —are of considerable economic interest.

I have often tried to keep these snakes alive, but never, until recently, have been able to find any food that they appeared to relish ; but while looking under a plank one summer for earthworms and slugs with which to feed some Dekay's Brown Snakes that were in the same glass case with the green ones, I found several of the Noctuid caterpillars that go by the name of "cutworms," and put them in the reptile case with the earth-worms. They had not been in for a minute before the Grass Snakes seized and eagerly devoured them, though they had rejected all other food that had been previously put into the cage. They continued to take them readily until the supply of "cutworms" was exhausted, and then, as I could find nothing else that they would eat, I let them go.

People generally try to kill grass snakes if they find them about their lawns, but it is evident that they should be protected and their enemies killed. No bird could have reached these caterpillars in the position where I found them under the plank, but it was just the kind of place into which a snake could creep and obtain its food. They probably eat other smooth caterpillars, and where numerous would be a check on the dreaded "army worm," for from the eager way they devoured the cutworms, Noctuid larvæ evidently constitute one of their favorite foods.

The Grass Snake is a beautiful little creature and perfectly harmless. Its food habits show that it is very beneficial, and it should be protected in every way and not destroyed or wantonly put to death.

. Ont., 1896, 16-21.

THE NORTH-WEST (CANADA) ENTOMOLOGICAL SOCIETY.

Annual Meeting.

The third annual meeting of the North-West (Canada) Entomological Society was held at Lacombe, Alberta, on November 9th, 1901. The chair was taken by the Vice-President, the Rev. M. White. Many letters were received in support of the meeting, among them being a letter from Dr. James Fletcher, Dominion Entomologist, of kindly advice to the young people of the newly-formed Lacombe Field Club, and a letter from Mr. C. W. Peterson, Deputy-Commissioner of Agriculture, N.W.T. Mr. Peterson expressed particular satisfaction at the number of agricultural societies throughout the North-West Territories which had decided to encourage the Entomological Society by affiliating with it. This, he said, is a step in the right direction, and that if agricultural societies would more generally support such institutions they would more nearly fulfil the objects contemplated in the law under which they were organized. An earlier letter from Mr. Peterson was also read advocating the enlistment of the sympathy of the school teachers and trustees throughout the Territories in support of the movement.

Among those present at the meeting were two of the teachers of the Lacombe school and a number of the pupils of the school.

The Chairman, after some opening remarks, called upon the President, Percy B. Gregson, for his address, which we give as follows :

President's Address.

"Ladies and Gentlemen,—We have now completed the third year of our existence as a society, and it has become the custom to review the progress we have made during the preceding year, and to consider what good we have done. By thus taking stock, as it were, of our conduct, we gain some light on the course we should pursue in the forthcoming year. In this vast new country a society of any sort to become popular has to enlist the sympathy and interest of the settler, and to do that it must show that its labors are identical with the farmer's welfare. When this is clearly understood the Society becomes a popular institution ; and this is one of the reasons why we have annual meetings. The chief work of the Society is to study and encourage throughout the land an interest in insects and plants and their habits, and a knowledge of the remedies used against such as are injurious. The time has passed when such a study was looked upon as an evidence of lunacy, and I believe we shall see, within the next few years, the introduction into every school in the country of a system of nature study. The young people must be encouraged to take an active interest in the subject. The study of insects is emphatically one which develops the powers of observation.

Some idea of the practical value of this subject to the farmer may be formed from the fact that the damage done by insects last year to the farming and gardening industries in North America amounted to many millions of dollars, and a glance presently at the list of injurious insects for 1901 will show that the Territories are sharers in this great loss. Farmers as a rule are wide-awake enough to anything which threatens their pocket, though it is strange how indifferent many of them seem when their crops are threatened by insects or weeds. They will allow, for instance, the wholesale destruction of turnips and cabbages by insects, when a few cents worth of hellebore and kainit, or Paris Green would have saved much of the crop. And farmers are just as culpable in the matter of weeds.

The question therefore arises,—"How does the Society propose to assist the Farmer?" and in answering this let us first see what we have already done.

In the Society there are two branches of study,—Entomology and Botany. Under Entomology is included insects (noxious, beneficial, harmless, etc.,) and under Botany is included the study of their food, and the study of weeds and other wild plants. Firstly, then, addresses

on insects or weeds have been given whenever requested at Farmers' meetings. About seven of these, besides some written addresses, have been given during the year at different places.

Secondly, the Society has distributed to every affiliated agricultural society (except to those but recently affiliated) a collection of ripe weed seeds, in little labelled bottles, of nearly every species of noxious weed within the Territories. This will enable any farmer, by applying to the Secretary of his Agricultural Society, to see what sort of weeds he has in his seed grain.

Thirdly, the Dominion Entomologist, Dr. Fletcher, has offered two prizes (standard works on Entomology) to the young folk of Lacombe district for (1) the largest collection of insects and (2) the best collection of noxious and beneficial insects, and the Society has supplemented these prizes by a cash prize of a dollar for the best collection of wild plants (including noxious weeds). There have been several young competitors. Prize No. 1 was won by Master Benj. H. Howell of Lacombe; prize No. 2 by Master D. E. Tipping of Waghorn, and that for wild plants and weeds, by Miss Lucy McL. Howell of Lacombe (all members of the Lacombe Field Club).

Fourthly, a Field Club has been formed of some of the young folk of Lacombe under the Society's auspices, and by the example these young people set, many of the prejudices against insects will, it is hoped, be dispelled. For instance, with what horror the dragon fly is often regarded. We hear them called "Devil's darning needles," and that they will sew up little boys' eyes and ears; and we hear of caterpillars and beetles that they will bite us; and many other similar prejudices exist. These prejudices really are harmful, because they lead our young folk into error, and on account of these prejudices many insects are cruelly destroyed which should be preserved, and on account, too, of them our young folk conceive a distaste for studying their habits.

Fifthly, the Society has distributed to non-subscribers some hundreds of copies of those two excellent agricultural papers, The Nor'west Farmer and The Farmers' Advocate. These papers, or one of them, should be taken by every farmer in the country. In addition to this, the Secretary of the Society has written (as replies) many scores of letters of advice on special noxious insects to farmers individually, with the remedies.

Within the last year several agricultural societies have affiliated with, *i. e.*, have become supporting and subscribing members of the Entomological Society. The names of these affiliated Societies are the Westaskiwin, Lacombe, Red Deer, Innisfail, Olds, Calgary (Inter-Western Pacific), Regina, Moosejaw and Central Saskatchewan. These in return for their financial support and influence have the right to claim addresses from the Entomological Society at their Institute or other meetings. The funds of the Society ($1 membership or affiliation) are supplemented by an annual grant from the Territorial government, and are devoted solely to extending the Society's work. This, then, is some outline of what the Society has already done.

Let us now turn to the next part of our programme:—"How shall we proceed in the future?" I think that the course I have just outlined should be further pursued. Every feature of it, and particularly that of encouraging the younger people, can I believe be extended with benefit to the country. Written or verbal addresses will be given willingly, whenever desired by affiliated agricultural societies. Further prizes will be offered for competition, and these competitions will next year be thrown open to the young folk throughout the Territories.

With regard to the schools, I may say that the teachers (3) in the Lacombe School are actively interested in the work of the Society, and the trustees of that school give every encouragement, and we hope to extend this interest to teachers in certain other schools next year;

and personally I should like every one (teachers and their pupils, farmers and their young folk are especially welcome) to come at any time to my residence, and inspect, under my supervision, the collections of the Society. There, besides many beautiful insects, they will see represented very many of the noxious and beneficial insects from all parts of the States and Canada, and learn the remedies.

More agricultural societies will also be invited next year to support the Entomological Society. This, as Mr. Peterson observes in his letter, is also a step in the right direction, and in accord with the spirit of the law under which the agricultural societies are formed, and with the sentiment of the Department. The distribution of collections of weed seeds will be extended, and a collection of named pressed noxious weeds themselves will gradually be prepared for each affiliated agricultural society. I am endeavoring to form collections of named noxious and beneficial insects for distribution in the same way. I want every insect—no matter how many—sent to me for that purpose every year. The Society will provide the cases and pay all necessary postages. It would be my wish to start a museum of weeds and insects in every school and agricultural society in the Territories if they would only show an active interest in the matter. I have prepared the first of such collections of weeds; this, if the Lacombe Agricultural Society will accept it, will go there and be kept near the collection of seeds, for public reference. A case of insects will also shortly be ready for it, and it will not be my fault if there is not also next year the founding of similar collections at the Lacombe school. Turning our attention now to the insects of 1901, I wish first to thank Mr. T. N. Willings, the Territorial Weed Inspector, and the many other gentlemen who have sent me very valuable accounts of insects noticed by them.

Noticeable Insects of 1901 in Alberta.

Undoubtedly the most conspicuous feature of the year throughout the whole of Central and Northern Alberta from Olds to Edmonton, and east into parts of Saskatchewan, has been the myriads of dragon flies. In the early part of the year we were threatened with an unusual plague of mosquitoes. The flooded sloughs teemed with their larvæ, but very soon after the appearance of the perfect mosquito the dragon flies came on the scene, and during July and August immense numbers filled the country, and in many parts they literally exterminated the mosquito on the wing. Nothing but good has ever been recorded of the dragon fly,—Fig. 57) in fact their mouths are not adapted for eating vegetation, and their larvæ and pupæ live wholly in water, and in both stages are active, their food being larvæ of mosquitos and other soft-bodied aquatic insects

Of a different nature, another remarkable occurrence of the season throughout the entire North-West from far south of Calgary, and reported by Mr. T. N. Willing, Mr. F. H. Wolley-Dod, Mr. Clare, of Edmonton, and residents in Prince Albert, Grenfell, Beulah (Man.), and elsewhere, has been the very large numbers of caterpillars of the Painted Lady butterfly (*Pryameis cardui*). The favorite food of these caterpillars is Thistle (including — let us be thankful—the Canadian Thistle), Blue Bur and Pasture Sage. Mr. A. J. Dennis, of Beulah, says that, during four consecutive days in the first week of May, there was a continuous flight of these butterflies in a south-easterly direction, with wind blowing from the south.

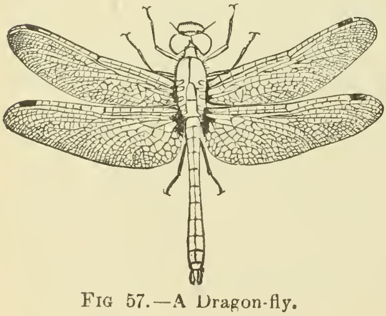


Fig 57.—A Dragon-fly.

Warbles this spring were decidedly more abundant than last year. The deaths of a good many cattle in the early part of the year were, I believe, accelerated, if not directly caused by this pest. On one carcase I counted 175 distinct warbles.

The Horse bot-fly has also been very troublesome.—(Fig. 58.) I might suggest here a simple remedy for this, which was published some time ago by the United States Department of Agriculture, and appeared in one of our agricultural papers. Bruise some Tansy and make an infusion of the juice,—in other words, tansy-tea. Give the horse some of this tea in the morning, and a dose of salts in the evening, and it is said a complete cure will be effected. The process seems like this,—the tea operating to kill the bots clinging to the membrane of the horse's stomach, and the salts expelling the dead bots.

Fig. 58.—Horse Bot-fly. Female.

The Diamond-back moth (*Plutella cruciferarum*) has been again very abundant in all parts of the Territories, seriously damaging many turnip and cabbage crops. The field of riddled and bleached plants was a common spectacle. From the presence last year of parasites in considerable numbers, there were hopes that this pest would not be troublesome this year, but every turnip and cabbage field neglected becomes a simple breeding ground for this insect.

Some cabbage crops about 12 miles east of Lacombe also suffered from the Red turnip-beetle (*Entomoscelis adonidis*). Its appearance is also reported from a few widely separated points in the Territories, but in certain places where it was abundant last year it seems temporarily, at least, to have disappeared.

The Colorado potato-beetle (*Doryphora decemlineata*) is gaining headway. They are reported from Calgary, MacLeod, Pincher Creek, Walsh, Moosejaw and other points. The winters are not fatal to this pest, which passes that season composedly in the pupa state.

Another pest of the potato field more troublesome this year than usual is a wireworm,—chiefly (so far as I have observed) the larva of a "Daddy Long-legs" or Crane fly (*Tipula*). It was a common thing (on taking an average sample) to find 15 per cent. of the potatoes affected by this grub. Reports of its prevalence come from all parts of the Territories.

Damage by root maggots of various kinds has also been conspicuous this year. It is reported from many points, and more particularly from Edmonton and St. Louis (Sask.). Cauliflowers, cabbages and turnips were all about equally the sufferers. Mr. Willing reports the larvæ of a "Cabbage" butterfly (*Pieris protodice*) as having been rather abundant in gardens around Regina, and here and there the little active flea-beetle (*Haltica striolata*) has been destructive to young turnips.

Of foliage trees, Mr. Willing mentions Tent-caterpillars of both species (*Clisiocampa Americana* and *C. disstria*) as having been abundant in Assiniboia, and, for the first time recorded, considerable numbers of the latter species appeared in the Red Deer and Lacombe districts (on aspen poplar). I found a large percentage of these were parasitised by Tachina flies, and I hardly think trouble will be given by this pest for awhile. Aspen poplar also suffered in early spring throughout the entire North-West from the Pallid aspen beetle (*Gonioctena pallida*); and the disagreeable larvæ of the Striped Cottonwood beetle (*Lina scripta*), the pest of osier growers, again attacked willows on river banks, and in Regina box elders suffered from the Box-Elder bug.

Of fruit trees, the black currant in gardens around Regina is reported to have suffered from the "Currant worm."

Cutworms, which must not be confounded with wireworms, from which they are in every way distinct, have not this year given so much trouble. The heavy rains were unfavorable for their development as a pest.

With regard to grain, there have been several complaints of injury to oats when in first blade, the blade wilting away and dying. In two cases which I went to see, the damage was the work of a wireworm of the same genus (*Tipula*) as that affecting potatoes, though a different

species. Mr. Willing mentions some talk by farmers of wheat being slightly damaged by an insect, but a report of a more serious nature comes from St. Louis (Sask.), where rye suffered from a stem-midge maggot, which fed within the stem about 1 to 2 feet above ground, and deadened the straw before the heads filled. Several farms, it was stated, bore evidence of the presence of this pest in the rye fields, the heads and straw turning white and dead six weeks before harvest.

A few more words and I will close the list. I made some mention last year of the liability of the arrival of new pests, to which we, in a new country, were always subject. It would seem there are this year two absolutely fresh pests to be reported, both of them beetles. One (*Trirhabda attenuata*) I have found in considerable numbers on raspberry canes (eating the canes bare of leaves), and the other (*Dichelonycha testacea*) on French beans and other garden stuff.

With regard to remedies, as I have taken up so much space already, I will, if the papers will lend me a column, publish in detail, before the winter closes, those which are recommended for each pest.

After the close of the discussion consequent on the address Mr. Howson P. Foulger, of Urquhart, near Lacombe, and Dr. A. E. Jamieson, of Lacombe, were elected members of the Society, and the officers of the Society for 1902 were elected. The officers for 1901 were re-elected, with the exception of Mr. W. Wenman (one of the Council), who has left the country, Mr. Foulger accepting office in his place.

Miss Lucy McL. Howell was then called up and received her prize from the chairman, and the books for prizes Nos. 1 and 2 (Dr. Fletcher's) were selected.

Acknowledgments of several gifts of insects to the Society's collections were then recorded, and the Report of the Council and the Auditor's Report read and the interesting proceedings terminated.

Report of the Council.

On behalf of the Council of the North-West (Canada) Entomological Society the President begs respectfully to submit the following report :--

There has been a somewhat drastic remodelling of the Members' Roll. For some two years the Roll has been encumbered with the names of gentlemen who, in the inception of the Society, became admitted as members, but who notwithstanding their membership have done nothing to help it forward. In our articles of constitution there is a clause providing for the automatic removal of such apathetic gentlemen from the Roll in the event of no interest in the Society being evinced by them for a period of eighteen months from enrolment. They cease to be members. These gentlemen occasion needless expense to the Society, and the result of the operation of the above mentioned provision has been that thirty names have been expunged from the Roll. The members helping the Society by cash or kind number thirty-seven. Space will not allow publication of their names, but the President, as the person perhaps most deeply interested in the success of the Society, takes this opportunity to thank each of them, as it were, in person. It would be invidious to single out any individual, as necessarily some have more facilities than others ; but all, as the President gratefully believes, support the Society from the purest and most disinterested motives. An institution of this kind is not a commercial concern paying dividends, though as an element of civilization such an institution does, it is conceived, benefit the community as a whole. This, however, the President can safely say, that had it not been for the guidance of his steps by Dr. James Fletcher, Dr. L. O. Howard, Mr. C. W. Peterson, Prof. C. C. James, Mr. H. H. Lyman, and the Rev. Dr. Bethune, and encouragement of other gentlemen, his pathway would have been strewn with boulders.

Additional substantial gifts of Lepidoptera by Messrs. N. B. Sanson, E. F. Heath, and William Wenman, and of Coleoptera by the Rev. Dr. Bethune and Messrs. A. W. Hanham and

Alex. Kwiat (and among the Coleoptera being a series of Parnidæ from Mr. W. D. Richardson), and most generous exchanges by Dr. Strecker, Messrs. W. N. Tallant, Frederick Knab, the Hon. P. C. Truman, and other gentlemen, and a gift by Dr. Fletcher of a series of mosquitoes, have materially augmented the Society's Collections. These gifts are extremely acceptable.

The interest of farmers in the objects of the Society is steadily increasing,—this is evidenced by the affiliation during the past year of additional agricultural societies with our own.

Dr. James Fletcher in the early summer generously offered two prizes for competition by the young folk of Lacombe for the best general collection of insects, and the best of noxious and beneficial insects, the Society adding a third prize for pressed wild plants (including weeds). The Lacombe Field Club furnished the prize winners among several competitors. Rains during the summer interfered somewhat with regular outings of the Club.

PERCY B. GREGSON, President.

November 7th, 1901.

AUDITOR'S REPORT.

Receipts and expenditure of the North-West (Canada) Entomological Society for 1901 :—

RECEIPTS.	$ c.	EXPENDITURE.	$ c.
Members' fees	25 00	Meetings (farmers, etc.)	14 85
Territorial Government Grant	25 00	Printing account	3 00
Deficit (met by President)	10 00	Subscriptions to agricultural, etc., papers	8 50
		Stationery	8 00
		Cork, pins, etc	5 40
		Apparatus	5 00
		Expense account (postages, freights, etc.)	10 25
		Sundries (including prize, and distribution of agricultural journals)	5 00
	$60 00		$60 00

I have examined the books and vouchers of the Treasurer of the North-West (Canada) Entomological Society, and find them correct, and the above is a true statement of its receipts and expenditure for 1901.

(Signed) J. L. TIPPING,
Auditor.

November 8th, 1901.

OBITUARY.

MISS ELEANOR A. ORMEROD, LL.D.

The Science of Entomology in its practical application to agriculture has suffered a great loss through the death of Miss Ormerod, which took place at her residence, Torrington House, St. Albans, England, on Friday, July 19th, 1901. Economic entomologists, not only in England but throughout the world, have been moved with profound regret that a career so remarkable and so useful should have been brought to a close, but one could hardly hope that the aged lady would long be able to sustain the burden of increasing infirmities and the trials of a painful and protracted illness.

Miss Ormerod was born at Sedbury Park, Gloucestershire, on May 11th, 1828, and had thus entered upon her 74th year. She was the youngest of a family of ten, consisting of seven sons and three daughters, of whom she was the last survivor. Her father, Mr. George Ormerod, LL.D., F.R.S., F.S.A., etc., was a distinguished literary man and the author of a notable "History of Cheshire;" her mother was a daughter of Dr. John Latham, F.R.S., at one time President of the Royal College of Physicians. On both sides, therefore, she inherited literary

and scientific tastes, and at an early age displayed a love for natural history and out-door pursuits.

One of Miss Ormerod's earliest recollections (as related by Dr. Fream in the "Journal of the Royal Agricultural Society") was being placed in a chair to watch some large water-grubs in a glass, when, to her amazement, one of the creatures which had been injured was devoured by its companions. This youthful observation inspired her with a taste for natural history investigations, and with them she combined a deep interest in botany, horticulture and agricultural chemistry; she also applied herself to the study of Latin, German, French, Italian, Spanish, and other languages. While devoted from her earliest years to objects of out-door life, she was constantly confined to the house by repeated illnesses, but this enforced seclusion only served to render her a more minute, painstaking and exhaustive observer. As her father became advanced in years, it devolved upon her to take a large share in the management of his estates, which included a home farm, and in this way, no doubt, she was led to give the practical turn to her entomological investigations which caused them to be of so much public value afterwards. She also when quite young took an interest, that she continued to maintain throughout her life, in meteorological observations, and in course of time published "The Cobham Journals" of meteorological and phenological records made by Miss Molesworth at Cobham in Surrey. She was the first lady to be admitted as a Fellow of the Royal Meteorological Society, as she was also the first lady to receive (in 1900) the honorary degree of Doctor of Laws at the University of Edinburgh. On the latter occasion Sir Ludovic Grant, the secretary to the Senatus, in presenting Miss Ormerod to the Vice-Chancellor, spoke as follows:—

"Our roll of honorary graduates in law contains the names of many illustrious men, but you will search in vain for the name of a woman. To-day, however, a new roll is to be opened—a roll of illustrious women, and it is matter for congratulation that this roll should begin with a name so honored as that of Miss Ormerod. The pre-eminent position which Miss Ormerod holds in the world of science is the reward of patient study and unwearying observation. Her investigations have been chiefly directed towards the discovery of methods for the prevention of the ravages of those insects which are injurious to orchard, field and forest. Her labours have been crowned with such success that she is entitled to be hailed as the protectress of agriculture and the fruits of the earth—a beneficent Demeter of the Nineteenth Century. It would take long to enumerate her contributions to entomological and phenological literature, but I may select for mention the valuable series of reports, extending over twenty years, the preparation of which involves correspondence with all parts of the world. Remarkable, too, is the list of the honors which she has received. She was the first lady to be admitted a Fellow of the Royal Meteorological Society, and she has been awarded the silver medal of the Société Nationale d'Acclimatation of France. To these distinctions the University of Edinburgh, sensible of her conspicuous services, and not unmindful of her generous benefactions, now adds its Doctorate in Laws."

A beautiful collection of injurious insects, and an accompaying series of diagrams, the work of Miss Georgiana Ormerod (her elder sister), now the property of the university and in the custody of the Industrial Museum, Edinburgh, were the much appreciated gift of Miss Eleanor Ormerod. An excellent oil painting of herself, also the gift of the generous donor, has been hung in the university court-room, where it occupies a suitable position in the inner circle of those whom the university has delighted to honour.

At Sedbury, where she continued to live until the death of her father in 1873, the farmers and farm labourers keenly appreciated the value of Miss Ormerod's studies when they understood what good results might follow from them, and they not only gave her the benefit of their own observations in the field, but rendered willing aid in tracing noxious insects and collecting examples of the mischief they were doing. By 1868 her attainments in the science of economic Entomology were so well recognized that she was invited to contribute to a collection then begun by the Royal Horticultural Society and the Science and Art Department of South Kensington,

to illustrate insects useful or prejudical to agriculture. She had previously invented a process of her own for the execution of plaster models, colored by her own hand, of rare garden plants and hot house flowers, and also a method of making electrotype casts of leaves and reptiles, which were remarkably beautiful and artistic. For ten years she was a constant contributor to these collections not only of insects, but also of interesting specimens of grain, roots, timber, etc., exhibiting the nature of the injury done. As an acknowledgement of the value of the assistance she thus afforded, the Royal Horticultural Society presented her with its "Silver Floral Medal."

In 1872 she contributed to the International Polytechnic Exhibition at Moscow a collection of models of insect injuries to plants and electrotypes representing British Natural History. On this occasion also her work was so highly appreciated that she was presented by the University of Moscow with its Silver Medal, its great Silver Medal, and also its Gold Medal of Honour. At a later date she was awarded the Silver Medal of the Société Nationale d' Acclimitation of France in recognition of her services in economic etomology.

In 1877 Miss Ormerod, then in her forty-ninth year, began, with the assistance of her sister. Georgiana, her especial work which caused her to become known throughout the world as the foremost authority in England on practical entomology. She then undertook the preparation of an annual "Report of observations of Injurious Insects and Common Farm Pests" and continued for twenty-four years to issue a volume at her own expense. When she commenced her arduous labours in this connection, very little was known by farmers and gardeners, and not much more by entomologists in Great Britain, of the habits and life histories of insects injurious to farm, garden and orchard crops and to live stock, or of the best means of destroying them or preventing their ravages. What Miss Ormerod did was to collect the observations of a large number of persons in the British Isles, made under her instructions for the most part, to obtain details of any experiments carried out for the destruction of insect pests or the prevention of their attacks, to correspond with workers in other parts of the world who were engaged in similar investigations, to systematise, arrange and publish the information thus obtained, with the addition of her own knowledge and observations of the subject. She also undertook to identify for enquirers any specimens of insects found preying upon their crops and to give prompt advice as to the most likely remedies to adopt. Her correspondence after a few years became immense and the work arduous in the extreme ; but she was a woman of boundless energy, full of inspiring enthusiasm, whom nothing could daunt and who shrank from no difficulties or trouble. Her sister Georgiana, her constant companion during these years till her death in 1896, possessed a large measure of artistic talent and was invaluable through her ability in drawing illustrations of insects and their works. She published some years ago a large series of excellent coloured diagrams of injurious insects, which the writer, as well as others, has found most useful for the illustration of lectures on subjects of this kind. Her loss was an irreparable one to her life-long companion and co-worker.

Something of the nature of Miss Ormerod's work, how she appreciated her correspondents, and the modest estimate at which she appraised her own great services to her country, are well stated in her simple and natural way in the preface to her last, the twenty-fourth, Annual Report. When she began the great work of her life in 1877, to quote her own words, "Comparatively little was known of the habits and means of prevention of insects seriously injurious to our crops, and of this little a very small amount was accessible for public service, and I undertook the series of Reports in the hope (so far as in my power lay) of doing something to meet both these difficulties." How fully her hope was realized is shewn by her further statement, "Now the *necessities* of the case have been gradually changing. Year after year information has been sent, gradually completing *most* of the histories of *most* of our worst insect pests, and now additional information is rarely on points of great agricultural importance." In other words she has succeeded, by dint of long continued and hard work, in making fully-known the life histories of all the most serious pests in the British Isles, and in prescribing the best avail-

able methods of dealing with them. No such work can ever be finished or ever be perfect, but Miss Ormerod has done the task of a pioneer ; she has cleared away the obstructions of ignorance and has laid solidly and well the foundations of a knowledge that requires now only to be kept up and added to as time goes on and changes naturally occur. A further quotation reveals the nature of her work and her recognition of the services of others :

"But the work was hard ; for many years for about five or six months all the time I could give to the subject was devoted to arranging the contributions of the season for the annual report of the year, with additions of the best information I could procure from other sources (in every case, whether of contributors or otherwise, fully acknowledged).... I claim no credit to myself in the work ; but those who will look over the names of the contributors given with their information will see how deeply indebted I am to them, and to other good friends, who have placed their experience and great knowledge at the public service. To them, and to all who have assisted me, and to some who have allowed what began as agricultural communication to ripen into valuable friendship, I offer my grateful thanks and my deep appreciation of their goodness, and I trust they will believe that if, as I well know, much of my work has not been as well done as it would have been in better qualified hands, at least I have earnestly tried to do my very best."

Miss Ormerod's investigations were not confined to insects affecting vegetation and farm products, but included those attacking live stock also. One of her most useful works was her campaign against the Ox Warble-fly, which she conducted with her accustomed energy and enthusiasm until the great suffering to animals, the heavy losses to their owners and the serious damage to hides which it caused became known far and wide. As a result of her work cattle-owners in all parts of the world now know the best course to pursue to rid their cattle of the maggots of the insect, or better still, to prevent the insertion of the eggs that produce them. Corresponding enemies of the horse, the deer and the sheep were also investigated by her, and the results published in the annual reports.

In addition to the four and twenty volumes of Reports, Miss Ormerod published a number of other works on Entomological subjects ; among these may be mentioned the "Manual of Injurious Insects," 1881 ; "Guide to Methods of Insect Life," 1884 ; "Injurious Insects of South Africa," 1889 ; "A Text-book of Agricultural Entomology" ; "Observations on Warble Fly" ; "A Hand-book of Insects injurious to Orchard and Bush Fruits" ; and a number of pamphlets on such subjects as the Hessian Fly, the use of Paris Green, the Turnip Fly, Root attacks on Turnips and Cabbage, etc.

Besides the distinctions already referred to Miss Ormerod was an honorary or corresponding member of a large number of Scientific Societies in Europe, America, Australia and South Africa, Fellow of the Entomological Societies of London and Stockholm, Honorary Entomologist to the Royal Agricultural Society and subsequently Examiner in Agricultural Entomology in the University of Edinburgh. For many years past she was an honorary member of, and took much interest in, our Entomological Society of Ontario.

Miss Ormerod was indeed one of the most remarkable women of the latter half of the nineteenth century, and did more than anyone else in the British Isles to further the interests of farmers, fruit-growers, and gardeners by making known to them practicable methods for controlling and subduing their multiform insect pests. Her labours were unwearied and unselfish ; she received no remuneration for her services, but cheerfully expended her own means in carrying out her investigations and publishing their results. In private life she was kindly and hospitable ; with an old-fashioned courtesy, and the manners and ideas of by-gone days, she and her sister possessed a charm all their own, and the writer recalls with pleasant memories his visit to their home at Isleworth. By whom in England her work can be contined we do not know ; it is not likely that anyone can follow in the unique path laid out by Miss Ormerod. We may therefore, cherish the hope that the Government of the day will hold out a helping hand and,

establish an Entomological Bureau for the lasting benefit of the great agricultural interests of the country. C. J. S. B.

Otto Lugger.

The ranks of American economic entomologists have suffered a serious loss through the death of Otto Lugger, State Entomologist of Minnesota. He died on the 21st of May, 1901, from pneumonia, after a very short illness, in the 57th year of his age. From Dr. L. O. Howard's obituary notice in *Science* the following particulars have been gathered. Mr. Lugger was born at Hagen, Westphalia, his father being a professor of chemistry in a Prussian university. In 1865 he came with his parents to the United States, and obtained a position in the Engineer Corps of the Army; he was engaged for two years in a survey of the Great Lakes. He had always been interested in entomology, and collected specimens during his engineering work. Becoming acquainted with Dr. C. V. Riley at Chicago, he went with him to St. Louis as assistant on his appointment to be State Entomologist of Missouri in 1868. For eight years he continued to be Dr. Riley's "quiet, unassuming, self-sacrificing and devoted helper." At the end of this period he married and removed to Baltimore, where he became the Curator of the Maryland Academy of Science and naturalist of the city parks. Ten years later, in 1885, he was appointed assistant in the Division of Entomology of the U. S. Department of Agriculture and remained in Washington for three years; he then became Entomologist to the State Agricultural Experimental Station of Minnesota and continued to hold this position till his death a few months ago.

"His first entomological experience in the State of Minnesota was one of great interest and importance, and his vigorous and intelligent action in the face of a great emergency fixed his standing as a most useful officer firmly in the minds of the Minnesota farmers. An enormous swarm of the Rocky Mountain locust, or western migratory grasshopper, had settled down in Ottertail County. By Lugger's advice and energetic field work, backed as he was by a public spirited and intelligent Governor (Hon. W. R. Merriam, now director of the U. S. Census), who personally guaranteed the funds necessary for the campaign, the hordes of destructive insects were annihilated and great damage was averted."

From that time on, for nearly 13 years, he continued his active work, issued frequent publications, and gained the profound respect of his constituents and of the scientific men of the country. His more important works were a series of profusely illustrated papers on the different orders of insects found in the State; the parts he was enabled to publish were on the Parasites of Man and Domestic Animals, the Orthoptera, Lepidoptera, Coleoptera, and Hemiptera of Minnesota. At the time of his death he was preparing the parts on Diptera and Neuroptera, which, it is hoped, may have been left sufficiently advanced for publication. The series, if he had lived to complete it, would have formed an admirable manual of Entomology for the Western States, and of use to naturalists everywhere; they were written in a clear and interesting manner, and prepared with great care and accuracy. He was also a good botanist, and published several useful papers on plant diseases.

In 1899 Mr. Lugger, accompanied Dr. Fletcher in an investigation of the areas in southern Manitoba which were infested by the Rocky Mountain Locust during the preceding year, and aided him in the discovery of eggs and freshly emerged young locusts near Deloraine. He also joined with Dr. Fletcher in addressing a number of meetings of farmers in different parts of the province.

He is described by Dr. Howard as "a man of admirable qualities; his wide information, his agreeable personality, and his keen sense of humour, made him a most delightful companion. Many of his stories and humorous sayings are current among entomologists all over the United States, and his loss will be felt for many years to come."

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